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EVALUATIONS OF THE EFFECTS OF THE COLUMBIA RIVER ON THE UNCONFINED AQUIFER BENEATH THE 100-N AREA

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SUMMARY

This study continued a previous study characterizing the effects of river stage and waste-water discharges on the unconfined aquifer under the 1301-N facility in the 100-N Area of the Hanford Site. The current study examined the effects of river stage and waste-water discharges under the larger 100-N Area. River levels were statistically correlated with water-level data from 12 wells in the 100-N Area, and the influences of regional water-table changes were evaluated. The study was conducted between April and November 1990.

Water-table elevations in the 100-N Area decreased throughout the study, dropping below the depths of some wells. The decline in water levels in the 100-N Area resulted primarily from the significant decrease in effluent discharged to the 13254-N and 1324-N/NA facilities in November 1989. A minor factor also contributing to the decrease in water levels in the 100-N Area is the regional decline of the water table due to the decrease in waste-water discharge in the 200 Areas.

During peak river stage in June the river level rose above water levels in several wells, causing a reversal in the hydraulic gradient and implying flow from the river into the aquifer. Such a reversal of flow could significantly influence travel times and paths of contaminants moving through the aquifer from the waste-water facilities. During high river stage, daily river-level fluctuations correlated with water levels in wells as far as 750 ft from the river shore. Seasonal river fluctuations correlated with water levels in wells approximately 1000 ft from the river shore. Time lags and attenuation factors increased with increasing distance from the river.

CONTENTS

SUMMARY iii

INTRODUCTION 1

METHODS 3

RESULTS 7

WATER-TABLE ELEVATIONS 7

PREDICTED BASE LEVEL 14

REGIONAL WATER-TABLE INFLUENCES 14

STATISTICAL ANALYSIS 16

Short-Term Analysis 17

Seasonal Analysis 19

CONCLUSIONS 21

REFERENCES 23

APPENDIX - WATER-LEVEL GRAPHS A.1

FIGURES

1 Map of the 100-N Area of the Hanford Site, Showing Monitoring Points 5

2 Columbia River Stage from March Through October 1990 8

3 Hydrographs of Wells a) N-3 and N-20 and b) N-34 and N-57 and River Stage from May Through October 1990 10

4 Water-Table Levels Beneath the 100-N Area in October 1990 12

5 Water Levels Beneath the 100-N Area in June 1990 13

6 Water-Level Changes in the 100 and 200 Areas Between June 1989 and June 1990 15

7 Water-Level Elevations at Well 81-58 from June 1987 Through October 1990 17

TABLES

1 Monitoring Points and Dates of Monitoring 4

2 Results of Statistical-Parameter Analysis of the Relationship Between River-Stage Fluctuations and Well Water-Level Fluctuations for June 9 Through June 30, 1990 18

3 Results of Statistical-Parameter Analysis of the Relationship Between River-Stage Fluctuations and Well Water-Level Fluctuations for October 1 Through October 22, 1990 18

4 Results of Statistical-Parameter Analysis Between Long-Term River-Stage and Well Water-Level Fluctuations from May 8 to October 25, 1990 20

INTRODUCTION

The change in operational status of the Department of Energy's (DOE's) N Reactor to "dry layup" in November 1989 resulted in a substantial reduction in the liquid effluent discharge to the ground in the 100-N Area of the Hanford Site. This reduction in discharge reduced the artificial recharge to the unconfined aquifer, thereby altering unconfined ground water flow under this area. Westinghouse Hanford Company (WHC), contractor to the Department of Energy, requested that Pacific Northwest Laboratory (PNL) perform a study to determine the effects of these changes on the ground water in the 100-N Area and on the resulting interaction of the unconfined aquifer with the Columbia River. The study is intended to support ground water-flow modeling efforts by WHC and the decision process for determining remedial cleanup actions in the 100-N Area. This study took place in two phases. The first phase was reported in Gilmore et al. (1990). This report covers the second phase.

The first phase of the study characterized the effects of Columbia River stage and waste-water discharges on the unconfined aquifer under the 1301-N facility. In this second phase, the study was expanded to evaluate these influences on the unconfined aquifer in the broader 100-N Area. Time-variant river-level data and water-level data from 12 wells in the 100-N Area were statistically correlated to determine time lag of low- and high-frequency data, attenuation characteristics, and how far inland these effects can be delineated. The influences of regional water-table changes on the 100-N Area also were examined.

The body of this report provides background to the study, discusses results and statistical analyses, and documents conclusions drawn from the second phase of the study. The appendix contains over 100 water-level graphs resulting from this phase of the study. For a summary of the geology and hydrology in the area, please see Gilmore et al. (1990).

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METHODS

Automatic water-level recorders collected continuous water-level measurements from 12 wells simultaneously in the 100-N Area from April through December 1990. These data and those from the previous study (Gilmore et al. 1990) represent approximately 1 year of continuous water-level monitoring. Table 1 lists the monitored wells and their dates of monitoring, and Figure 1 shows the locations of the wells. As a result of the previous findings, two water-level recorders were repositioned for the second half of the study. In May 1990 the recorder from well N-23 was moved to well N-14 to better delineate the effects of the river on the water table at the north end of the 100-N Area. Also in May 1990, the recorder in well N-66 was moved to well N-57 to provide a better location to observe the effects of the 1324-N/NA facility on the water table.

Water-level data in the wells were gathered using three types of continuous water-level monitoring equipment: chart-type stage recorders, stage recorders with attached data loggers, and data loggers with bridge-type transducers. Columbia River stage data were obtained from the Hanford Generating Project, located several hundred feet upstream of the 100-N Area. Table 1 summarizes the types of water-level recorders installed. Graphs of the Columbia River stage data and of water levels in the wells from April through November 1990 are presented in the appendix.

Water-level measurements using steel tapes were taken at the beginning of each data-collection period to calibrate the data loggers to a known level and to index the charts on the stage recorders with respect to time. To verify the instruments' readings, calibration measurements were also taken periodically, usually once a week, during data-collection periods. When steel-tape measurements did not correspond to the instrument's recording, the instrument was reset. The tapes used in this study were compared with a standard tape that is calibrated annually by the Westinghouse Standards Laboratory and is traceable to the National Institute of Standards and Technology (PNL Procedure WL-2). The steel-tape measurements are indicated on the hydrographs in the appendix.

TABLE 1. Monitoring Points and Dates of Monitoring

Monitoring Point	Recorder Type	Data-Collection Frequency, min	Dates in Service
Well N-3	Stevens Recorder	60	2/2/90-12/3/90
Well N-8S	Hermit logger with pressure transducer	30	1/10/90-12/3/90
Well N-8P	Hermit logger with pressure transducer	30	1/10/90-12/3/90
Well N-14	Terra Logger with pressure transducer	30	5/3/90-12/3/90
Well N-20	Stevens Recorder with electronic logger	30	12/28/90-12/3/90
Well N-23	Stevens Recorder with electronic logger	60	12/20/89-5/3/90
Well N-25	Stevens Recorder	60	12/20/89-7/3/90
Well N-27	Stevens Recorder with electronic logger	30	10/25/89-12/3/90
Well N-34	Stevens Recorder	60	12/20/89-12/3/90
Well N-51	Stevens Recorder	60	12/5/89-12/3/90
Well N-57	Hermit logger with pressure transducer	30	5/3/90-12/3/90
Well N-58	Hermit logger with pressure transducer	30	12/22/89-12/3/90
Well N-66	Hermit logger with pressure transducer	30	2/4/90-5/3/90
Well N-67	Terra logger with pressure transducer	30	10/19/89-12/3/90
River	Air Bubbler System	60	10/18/89-11/30/90

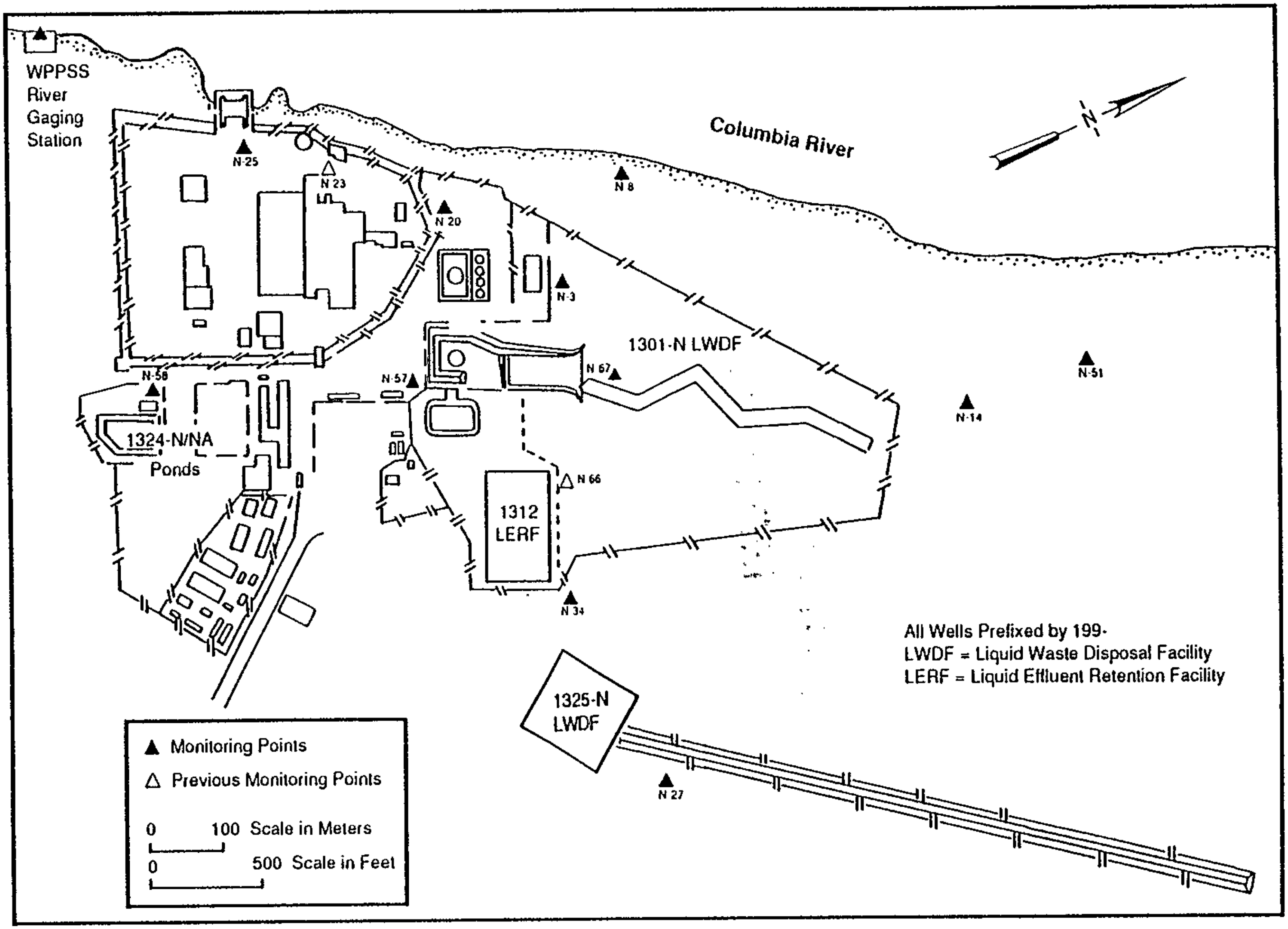

FIGURE 1. Map of the 100-N Area of the Hanford Site, Showing Monitoring Points

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RESULTS

WATER-TABLE ELEVATIONS

The general trend throughout the second phase of the study was a decrease in the water-table elevations at the 100-N Area. (Water-level data are shown in Appendix A). One of the most dramatic examples of the declining elevations is the water table dropping below the completed depths of some of the wells in the 100-N Area, or the "drying up" of the wells. The water-levels began to drop significantly in November 1989, when the volume of discharge to the disposal facilities 1325-N and 1324-N/NA decreased from approximately 1500 gpm to less than 300 gpm. In general, the wells around the 1312 Liquid Effluent Retention Facility (LERF) and the 1324-N/NA facility are dry or are close to drying up. Water levels in well N-27, near the 1325-N facility, have been steadily declining throughout both study periods. In November 1990, at the end of the study period, the chart recorders indicated that the water levels in well N-27 were continuing to drop approximately 0.1 ft per week. This continuous and steady decline in water level is believed to be the last remnant of the declining ground water mounds (see Smith et al. 1989a,b and Gilmore et al. 1990) under the 1324-N/NA and 1325-N facilities. The water levels in well N-3 also continued to drop in October and November 1990, at approximately 0.5 ft per week. An interruption of the declining trend in this well occurred during the high river stage in June, when the well rose approximately 2 ft. At this well it is difficult to differentiate between the effect of declining ground water mounds and the influence of the river on the water levels.

Historically, low river stage on the Columbia River near the 100-N Area occurs between October and December, and high river stage occurs during June and July (Columbia River Water Management Group, 1983). Figure 2 shows river stage for an 8-month period in 1990. During October, the river was at its low point for the year, ranging between approximately 381 and 383 ft above MSL. During June 9 to 30, when spring runoff dominated river flow, the river was at its highest level, ranging between 387 and 395 ft above MSL.

Daily river-level fluctuations and the seasonal extremes in river stage both influenced water levels in wells N-8, N-20, and N-51, which are near the

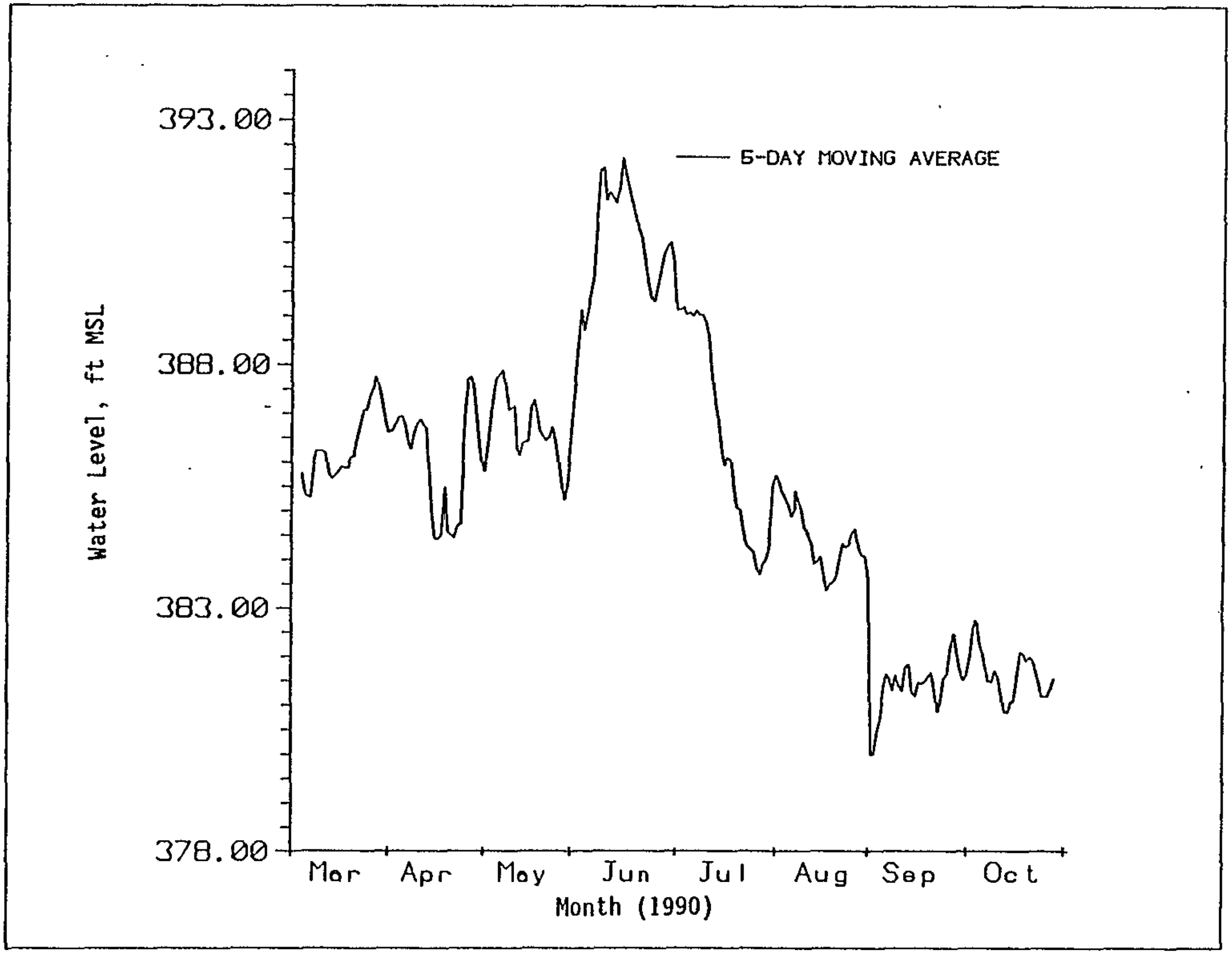

FIGURE 2. Columbia River Stage from March Through October 1990

river. (Figure 3 shows the effects of river stage on water levels in wells N-3, N-20, N-34, and N-57). Water levels in wells N-3 and N-14 were also influenced by these extremes. The short-term daily water-level fluctuations in wells N-3 and N-14 are also present, though heavily dampened. These wells are located near the 1301-N facility at distances of 650 and 440 ft from the river shore.

The water levels in wells N-57 and N-67, also located near the 1301-N facility, appear to be unaffected by the low river stage in January but did respond to the high river stage observed in June. Wells N-57 and N-67 are located farther from the river, at distances of approximately 1000 and 750 ft.

The seasonal extremes in river levels did not appear to affect wells N-27, N-34, and N-58, which are located still farther inland than are N-57 and N-67. Except for minor interruptions caused by discharges to the liquid waste facilities, water levels in wells N-27, N-34, and N-58 appear to have declined gradually between March and October 1990. These declining water levels are attributed to the dissipation of the ground-water mound caused by reduced discharges to the 1325-N Liquid Waste Disposal Facility. Water-table maps constructed for the 100-N Area (Smith et al. 1989a,b) indicate that the ground-water mounds under the 1324-N/NA facility and the 1325-N facility have largely dissipated. The maximum elevation of the water table beneath the 1325-N facility was approximately 413 ft MSL in May 1989. The elevation of the water table beneath the facility in January 1990 was approximately 393 ft MSL (Gilmore et al. 1990), and in October 1990 the elevation was 389 ft MSL. The rate of decline between May 1989 and January 1990 was 0.08 ft/day. Between January and October 1990 the rate slowed an order of magnitude, to approximately 0.008 ft/day. The decline rate is anticipated to slow even more as a steady-state condition is approached.

River-stage fluctuations caused by seasonal effects influence the hydraulic gradient near the river. During low river stage the water table is generally sloped to the river, as expected, causing ground water discharge (Figure 4). During high river stage, however, the river stage rose above water levels in several wells, particularly during peak periods (compare Figures 3 and 5). This rise indicates a temporary reversal in the hydraulic

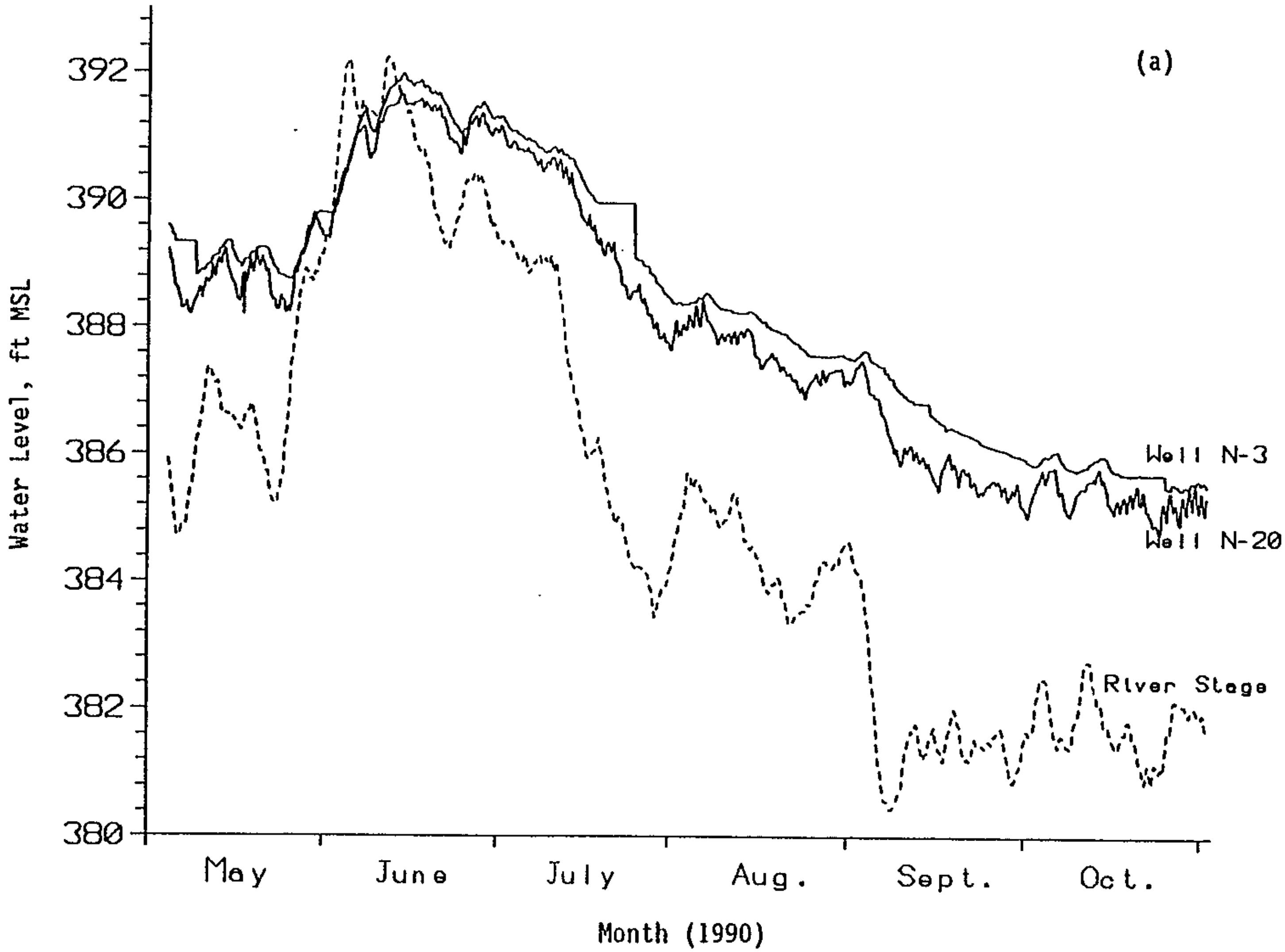

FIGURE 3. Hydrographs of Wells a) N-3 and N-20 and b) N-34 and N-57 and River Stage from May Through October 1990

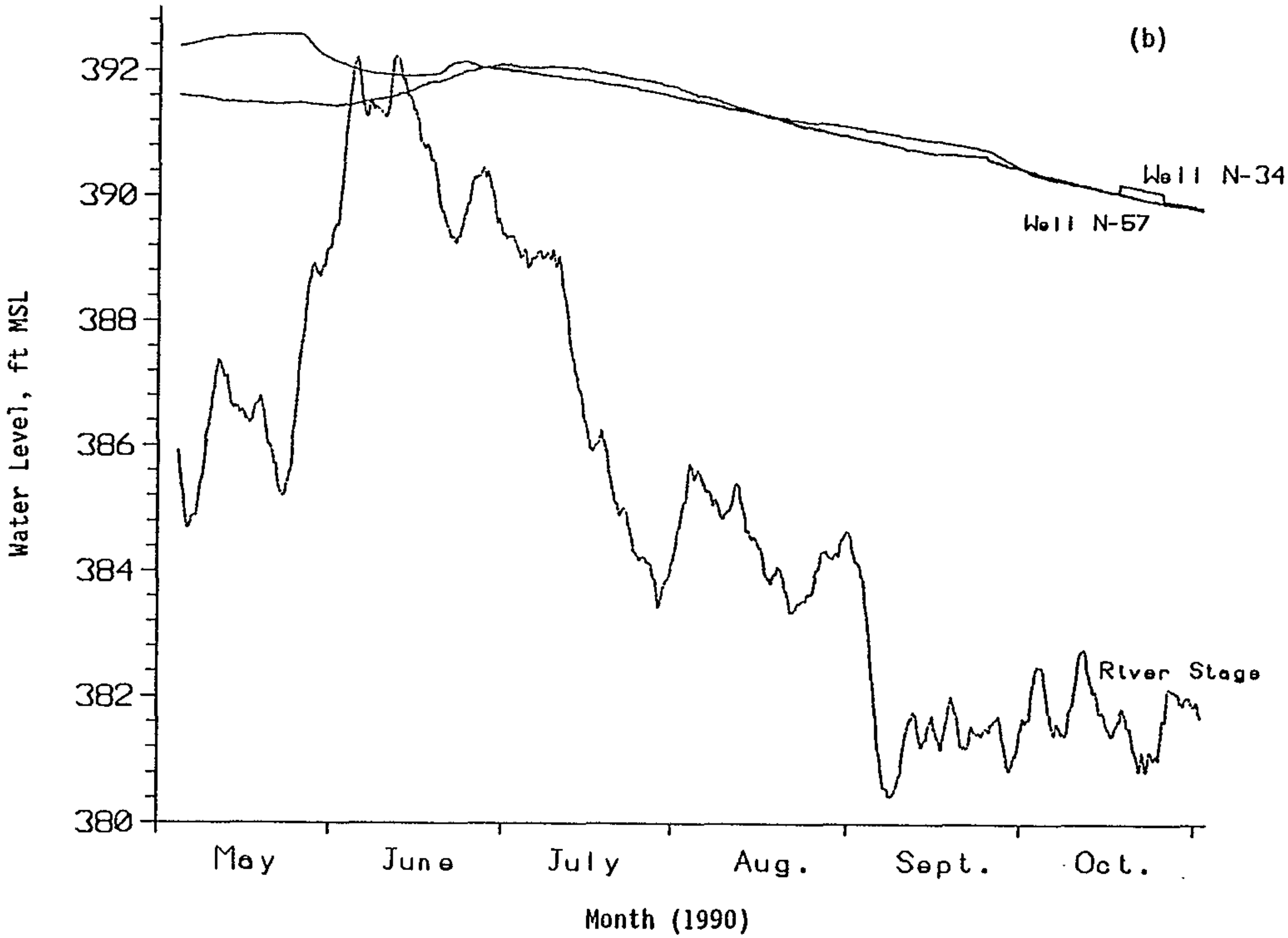

FIGURE 3. (contd)

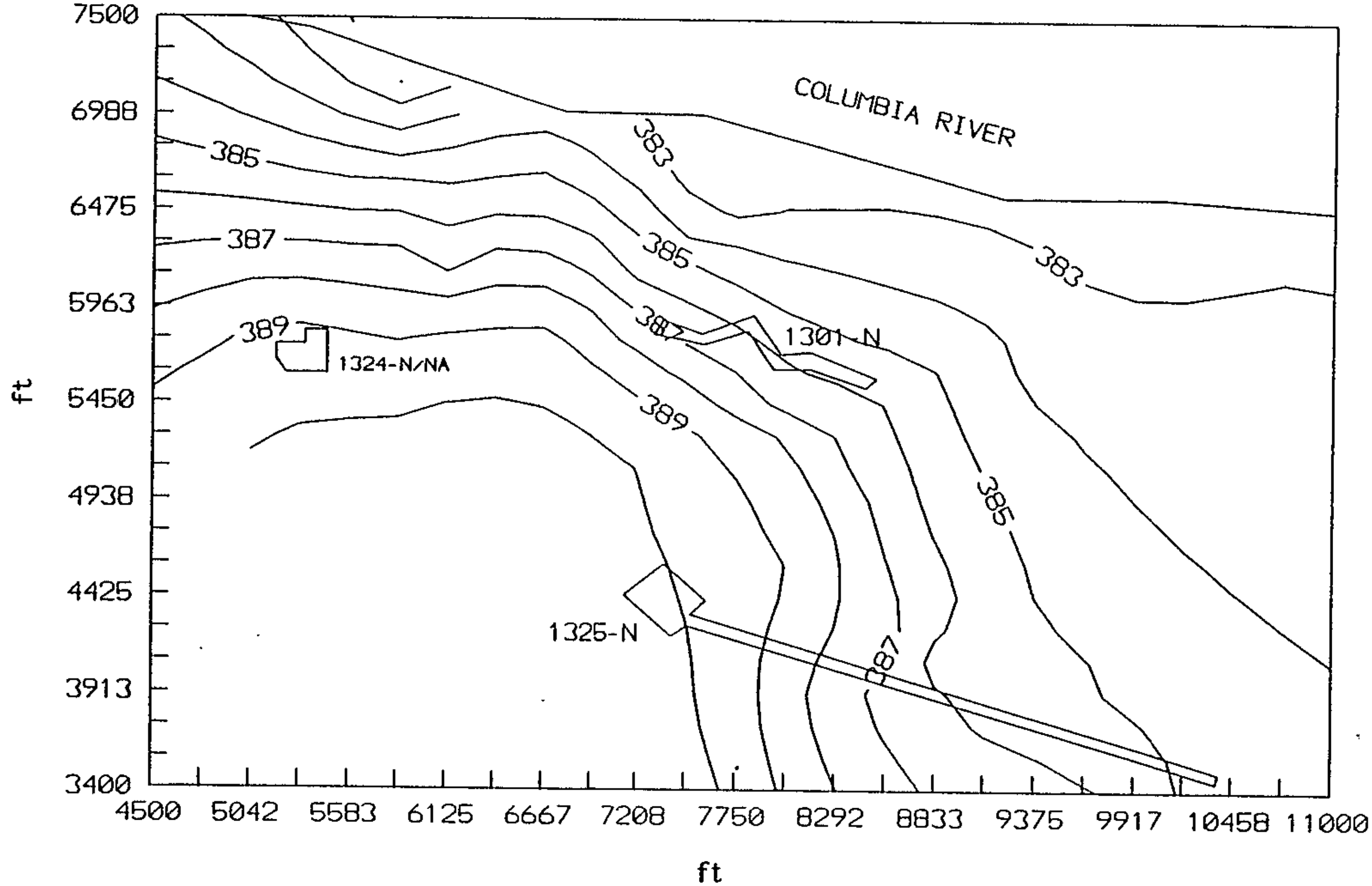

FIGURE 4. Water-Table Levels Beneath the 100-N Area in October 1990

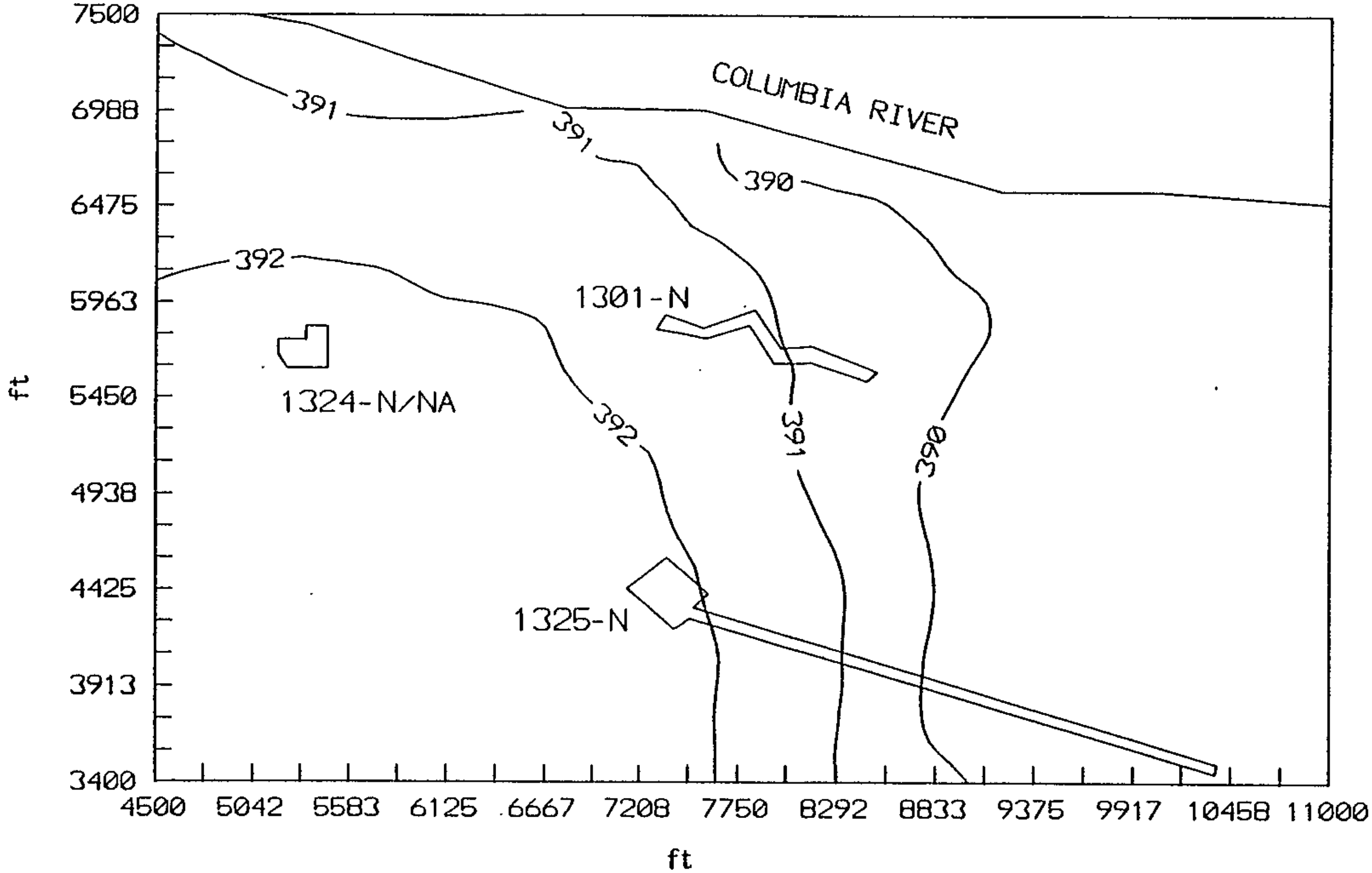

FIGURE 5. Water Levels Beneath the 100-N Area in June 1990

gradient, implying flow of river water into the unconfined aquifer. This reversal in gradient was greatest during the high river stage in June. The reversal may have a significant influence on the travel times and paths of contaminants in the system, particularly near the river.

PREDICTED BASE LEVEL

At Well N-27 the water-level elevation in November, at the end of this study, was 389 ft above MSL and continuing to decline; the average river elevation was 385 ft. Assuming that the average river stage does not change, this level would indicate that the water levels at N-27 could drop a maximum of 4 ft more. It is much more likely, however, that the water level near N-27 will drop less than 4 ft, because of the regional gradient toward the river. Assuming no future discharges of waste water in the 100-N Area, the water table will eventually reach a "base level" in which the ground water system is in equilibrium with the regional water table and river. The actual height of this base level is difficult to predict and will be influenced in part by the regional water-table fluctuations. Historical water-level data prior to the construction of the 100-N Area do not provide much insight into the water-table base level, because the regional water-table conditions at that time were different.

REGIONAL WATER-TABLE INFLUENCES

Regional ground water flow up-gradient of the 100-N Area can influence ground water flow in the Area, causing changes in the hydraulic gradient and in water-table elevations. The primary controlling influences on the water table up-gradient of the 100-N Area are waste-water discharge practices in the 200 Areas. Ground water passing beneath the 100-N Area flows from the 200 Areas northward through the gap between Gable Mountain and Gable Butte (see Figure 6) and discharges to the Columbia River. With the current decrease in liquid effluent discharged to the ground in the 200 Areas, the regional water table will decline. Water-table maps of the Separations Area and the Hanford Site are published semiannually (Kasza 1990; Kasza et al. 1989; Newcomer and McDonald 1990; Newcomer et al. 1990). Maps of the 200 Areas indicate that the water table declined less than 1 ft between

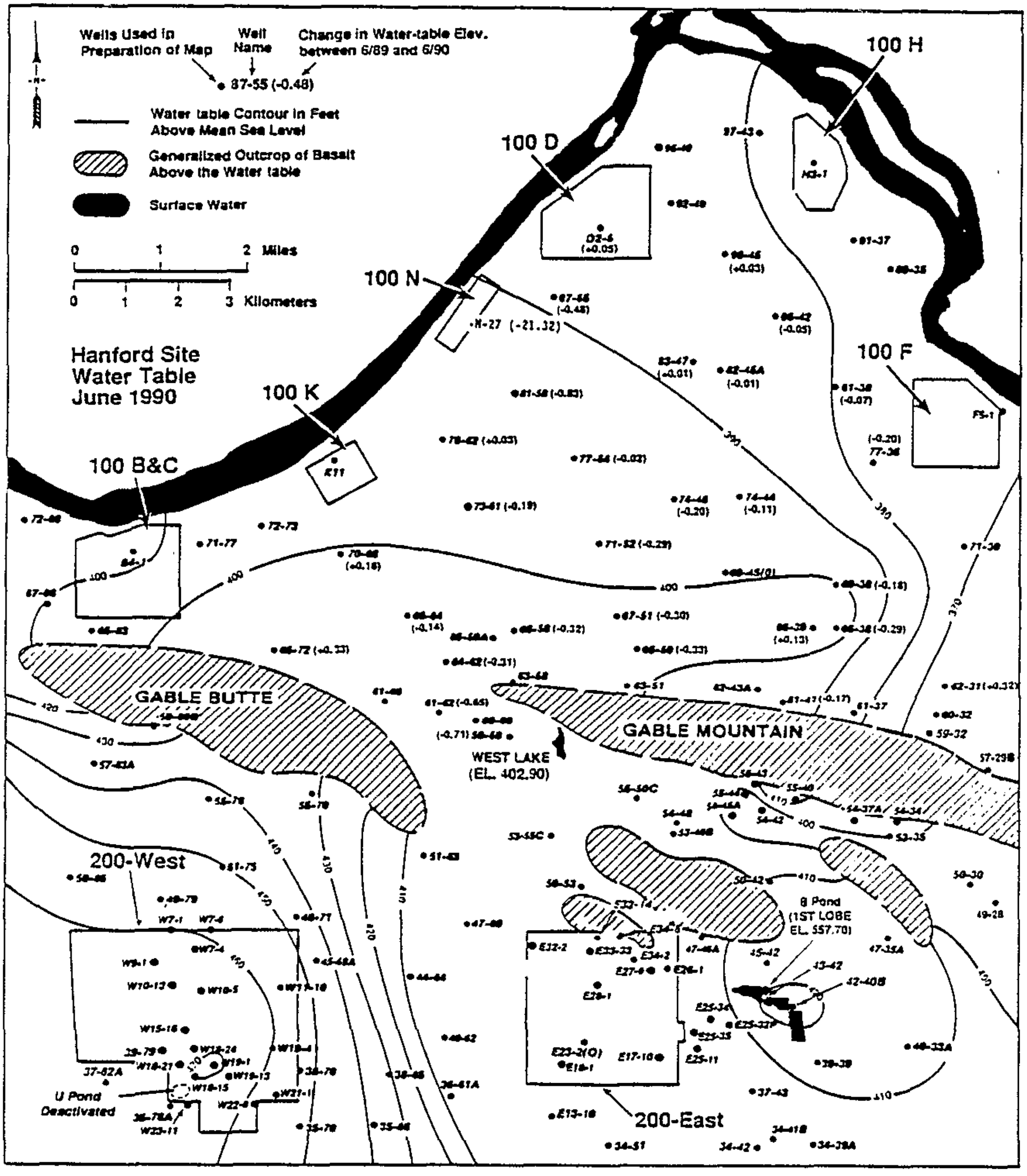

FIGURE 6. Water-Level Changes in the 100 and 200 Areas Between June 1989 and June 1990

June and December 1989. Water-level data collected in June 1990 indicate that the water table continued to decline. Figure 6 shows water-level changes between June 1989 and June 1990 in the 200 Areas and in the 100 Areas. Figure 6 indicates that the water-level decline in the 200 Areas minimally affects water levels beneath the 100-N Area compared with influences from the 100-N disposal facilities and river stage.

Decreased waste-water discharge in the 100-N Area has affected the water table up to about 1 mile up-gradient. The large water-level decline of 0.83 ft observed in well 699-81-58 (Figure 6) is believed to be a response to decreased waste-water discharge in the 100-N Area. The water levels show a steady decline at well 699-81-58 since November 1989 (Figure 7).

STATISTICAL ANALYSIS

The water-level data were statistically analyzed to correlate the water-level fluctuations observed in the wells with the river stage fluctuations recorded at the gaging station. The purpose of the statistical analysis was to quantify the relationship between these water-level fluctuations. This relationship can be used to evaluate the influence of the river stage on the water table. Two frequencies of river-level cycles were analyzed for high frequency (e.g., short-term daily fluctuations) and low frequency (e.g., long-term seasonal fluctuations). The reported analysis in Gilmore et al. (1990) was for the short-term data in the month of January. Short-term data analyzed here are for the months of June and October. In addition, long-term seasonal data were analyzed for an 8-month period, from May to October 1990, which includes high and low river stages.

The statistical procedure used to evaluate the water-level fluctuations in the wells is a Fast Fourier Transform (FFT) algorithm using a verified program taken from Press et al. (1986). This algorithm allows for rapid digital processing on a microcomputer (Brigham 1974). A description of the FFT procedure, including equations, is summarized in Gilmore et al. (1990).

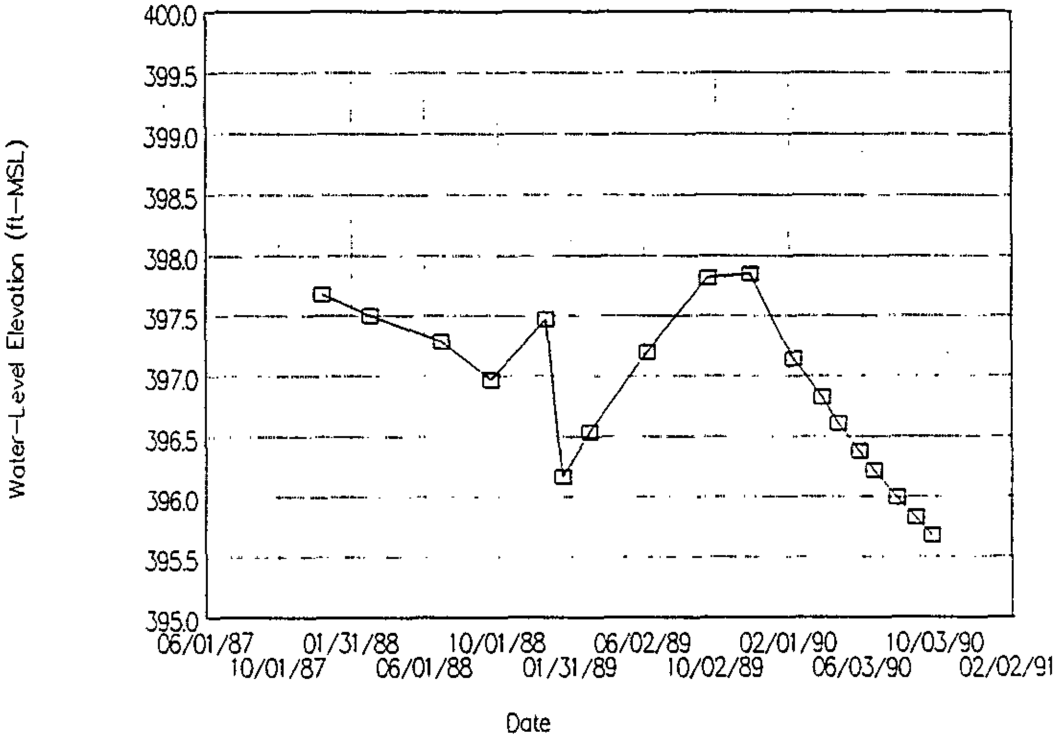

FIGURE 7. Water-Level Elevations at Well 81-58 from June 1987 Through October 1990

Short-Term (High-Frequency) Analysis

Statistical analyses were applied to hourly water-level data for the periods June 9 through June 30 and October 1 through October 22, 1990. These periods were chosen because the river-stage fluctuations observed in June and October 1990 are typical of short-term river stage fluctuations and because these months represent the seasonal extremes in river stage.

The sampling frequency of 1 h over a period of approximately 21 days is the same as the analysis described in Gilmore et al. (1990). Hourly measurements over each of the 21-day periods are sufficient for statistically analyzing short-term effects. The results of the statistical-parameter analyses are tabulated in Tables 2 and 3.

The results in Tables 2 and 3 indicate strong correlation between high-frequency river-stage fluctuations and the water-level fluctuations observed in piezometers N-8S and N-8P (located approximately 80 ft from the river) and

TABLE 2. Results of Statistical-Parameter Analysis of the Relationship Between River-Stage Fluctuations and Well Water-Level Fluctuations for June 9 Through June 30, 1990

Well	Distance to River, ft	Correlation	Calculated Lag Time, h	Attenuation Factor
199-N-8S	80	0.99	<1	0.64
199-N-8P	80	0.95	<1	0.27
199-N-03	300	0.25	29	0.08
199-N-14	440	0.26	28	0.06
199-N-20	190	0.42	6	0.08
199-N-27	2500	-0.46	223[a]	0.01
199-N-34	1700	-0.46	245[a]	0.01
199-N-51	320	0.69	<1	0.17
199-N-57	1000	-0.33	255[a]	0.03
199-N-58	1300	-0.47	250[a]	0.02
199-N-67	750	0.40	23	0.01

(a) Time lag and correlation are not believed to represent river response, due to low correlation.

TABLE 3. Results of Statistical-Parameter Analysis of the Relationship Between River-Stage Fluctuations and Well Water-Level Fluctuations for October 1 Through October 22, 1990

Well	Distance to River, ft	Correlation	Calculated Lag Time, h	Attenuation Factor
199-N-8S	80	0.96	<1	0.40
199-N-8P	80	0.93	<1	0.18
199-N-20	190	0.38	4	0.07
199-N-27	2500	0.11	163[a]	0.01
199-N-34	1700	0.00	163[a]	0.02
199-N-51	320	0.79	2	0.13
199-N-57	1000	0.12	164[a]	0.02

(a) Time lag and correlation are not believed to represent river response, due to low correlation.

in well N-51 (located 380 ft from the river). Weak correlation exists between the high-frequency river-stage fluctuations and water-level fluctuations observed in wells N-3, N-14, N-20, and N-67 (located between 190 and 750 ft from the river). Hydrographs of these wells for June 1990 are shown in the appendix. The water level in well N-67 falling below that in N-14 is associated with measurement drift in the recording equipment.

The low correlation values in Tables 2 and 3 indicate that high-frequency river-stage data do not correlate with water-level data from wells N-27, N-34, N-57, or N-58. Also, the correlation values calculated for these wells differ between June and October. Correlation values for wells N-27, N-34, and N-57 were calculated to be higher for October when the river was low and for June when the river was high.

For those wells in which water-level fluctuations correlate with river-stage fluctuations, correlation varies little between the June 1990 data, when the river stage was high, and the October 1990 data, when the river stage was low.

Tables 2 and 3 also show the approximate time lag in the high-frequency responses and the attenuation factor associated with well water-level data exhibiting correlation with river stage fluctuations. Time lag is the delay in hours before fluctuations in the river affect fluctuations in the well. The attenuation factor relates to the amount the river fluctuation is dampened before it reaches the well.

A gradual increase in time lag and attenuation inland is evident in wells N-8S, N-51, N-20, N-3, N-14, and N-34. The calculated time lag for wells N-27, N-34, N-57 and N-58, however, are anomalistically high, due to the low correlation values, and are not believed to represent response to the river.

Seasonal (Low-Frequency) Analysis

Statistical analysis was also applied to longer-term water-level data to correlate the river-stage flood wave caused by seasonal effects with water-level responses observed in wells at various distances from the river. Data from wells N-3, N-20, N-34, and N-57 were used in the analysis. Data were analyzed from a 5 1/2-month period, May 8 to October 25, 1990, which covers the seasonal extremes in river stage. A 5-day moving average was applied to the river-stage data at 2-h increments, to filter out the short-term fluctuations. The water-level data from the wells were not filtered. The results of the statistical-parameter analysis are tabulated in Table 4.

The results in Table 4 indicate strong correlation between the filtered river flood-wave data and the water-level responses in wells N-3, N-20, N-34, and N-57. With the exception of well N-34, the time lag associated with the response in each well increased with distance from the river. The attenuation factor decreased with distance from the river. The time lag of 0 h associated with the water-level response in well N-34 suggests that the water levels in this well, at maximum correlation, are coincidental with the river flood wave. That this correlation is coincidental suggests that a correlation between the water-level response in well 34 and the river flood-wave cannot be determined.

TABLE 4. Results of Statistical-Parameter Analysis Between Long-Term River-Stage and Well Water-Level Fluctuations from May 8 to October 25, 1990

Well	Distance to River, ft	Correlation	Calculated Lag Time, h	Attenuation Factor
N-03	300	0.84	64	0.46
N-20	190	0.96	38	0.60
N-34	1700	0.77	0	0.18
N-57	1000	0.78	162	0.19

CONCLUSIONS

Water-table elevations continued to drop during 1990, primarily due to the substantial decrease in liquid effluent discharged to the 1325-N and 1324-N/NA facilities. It appears, however, that the base level is being approached, because the rate of decline is decreasing, and the water levels in the wells are approaching the average elevation of the river.

A seasonal variation in river stage was observed, the highest river-stage elevations occurring in June and the lowest occurring in October. During high river stage, the river-level fluctuations affect the water-level fluctuations in the wells farther inland than during lower river stages. Short-term, daily river-level fluctuations correlated with water levels in wells as far inland as well N-67, which is approximately 750 ft from the river shore during high river stage. This distance inland that daily river-stage fluctuations affected water levels was greater than what was observed in October 1990, during low river stage, or in January 1990 (Gilmore et al. 1990). The longer-term, seasonal river fluctuations correlated even further inland than did the short-term effects. Seasonal fluctuations correlated with water-level fluctuations in well N-57, which is approximately 1000 ft from the river shore. The time lag associated with the response in each well increased with distance from the river, as did the attenuation factor.

During high river stage, for a short period the river level was higher than the water levels in the wells. This indicates a temporary reversal in the hydraulic gradient and implies flow of river water into the unconfined aquifer. Such flow may have a significant influence on the travel times and paths of contaminants moving through the unconfined aquifer from the waste-water facilities.

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APPENDIX

<u>WATER-LEVEL GRAPHS</u>

APPENDIX

WATER-LEVEL GRAPHS

This appendix contains hydrographs of water-levels in 14 wells in the 100-N Area. Data were collected from the following wells from April 1 to December 3, 1990: N-3, N-8P, N-8S, N-14, N-20, N-23, N-25, N-27, N-34, N-51, N-57, N-58, N-66, and N-67 (see Figure 1 and Table 1). Only 12 of the wells were recording simultaneously. In May 1990 wells N-23 and N-66 were replaced with wells N-57 and N-14. The data collected from these wells were compiled into graphs that are included here. The following paragraphs summarize by well the data presented in the graphs that follow.

Data collection in well N-3 was generally good, but periods of data-collection interruption occurred when the water level ranged between 389 and 390 ft elevation. At this elevation, the float on the water-level recorder would hang up on the pump wires. Periods of data interruptions occurred in March, April, May, and July. The longest interruption was 6 days.

Wells N-8P and N-8S yielded good uninterrupted data throughout the study period.

Wells N-14 and N-67, which each had a Terra Sciences data logger, did not always agree well with the steel-tape measurements. In well N-14, two steel-tape readings in June were more than 1 ft off of the pressure-transducer reading on the data logger. The steel-tape measurements in July and in September were consistently above the recorded pressure-transducer readings. The steel-tape readings in September ranged from 0.3 to 0.6 ft above the readings recorded on the data logger. Similar drift problems in the logger data were encountered in well N-67. The steel-tape measurements were consistently 1 to 2 ft higher in May, June, and July. Also, a logger malfunction occurred at the end of July. The data in August and September agreed better with the verification steel-tape measurements. The instruments in wells N-14 and N-67 stopped recording in September, due to memory-capability problems, and no data were recorded between the end of September and December, when the logging equipment was removed.

The absolute values of the readings on the data loggers from wells N-67 and N-14 are in question and therefore are not used in the statistical analysis of the data in this report. The water-level graphs are only used qualitatively for trend and for water-level fluctuation durations.

The data from wells N-20 and N-23 generally agreed well with the steel-tape measurements. One period in April the data loggers from each of the wells were removed for a 6-day period to allow for water sampling.

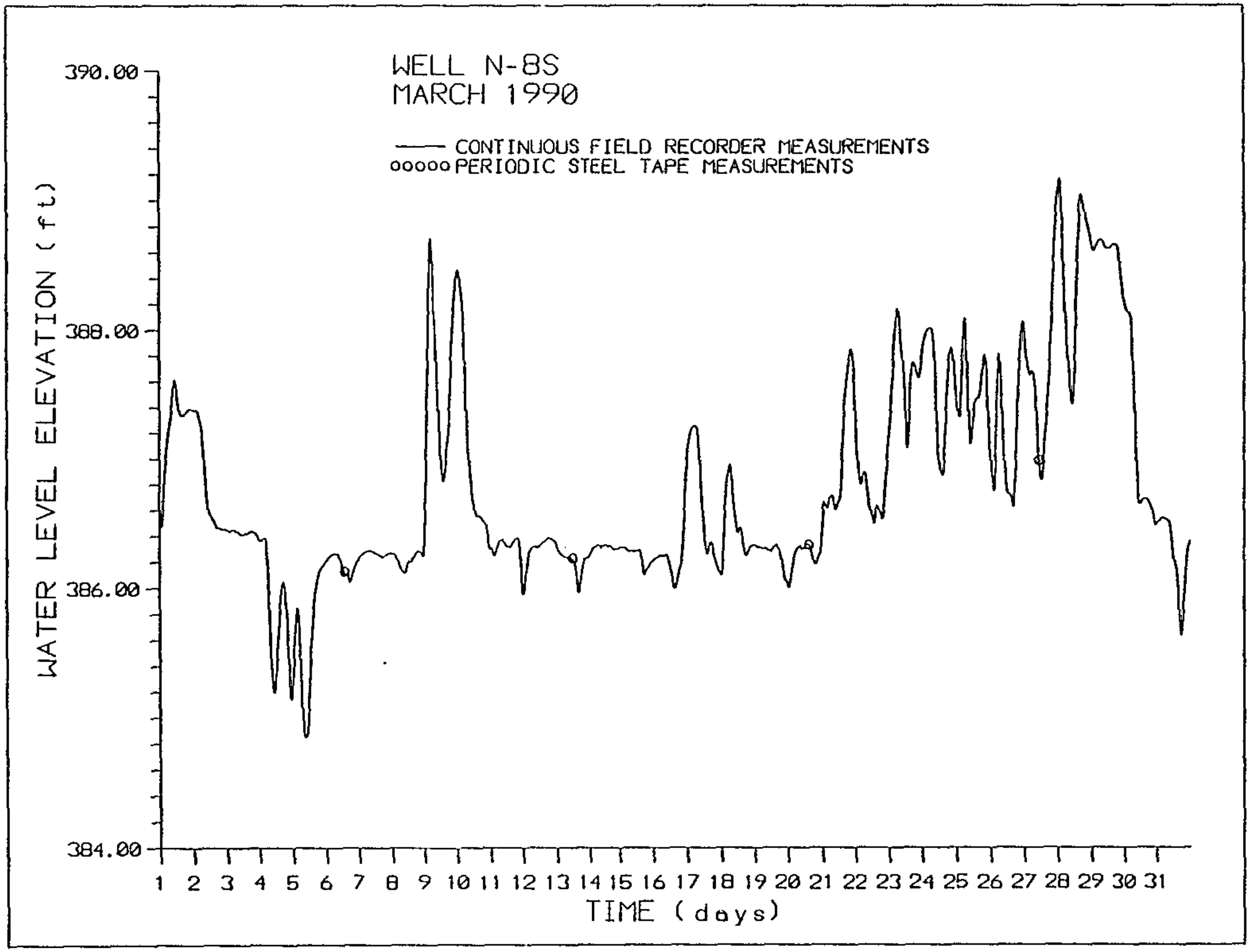
The data from wells N-25, N-27, and N-51 also agreed well with the steel-tape measurements. From April 23 to 25 an equipment failure in well N-25 resulted in a loss of data for a 2-day period from that well. In well N-51, in a short period in April the steel-tape measurements were a few tenths of a foot above the pressure-transducer data. For the rest of the data-collection period for this well the pressure-transducer readings matched the steel-tape measurements.

Well N-34 has sharp increases and decreases. These measurements were reset each time a steel-tape measurement was taken.

Wells N-57 and N-58 recorded good, continuous data throughout the study. In late July, however, the recording in well N-58 was cut short when that well essentially dried up, when the water level in the well decreased to less than 1 ft. The graph of well N-58 in July begins to record barometric responses when the pressure transducer is exposed to air.

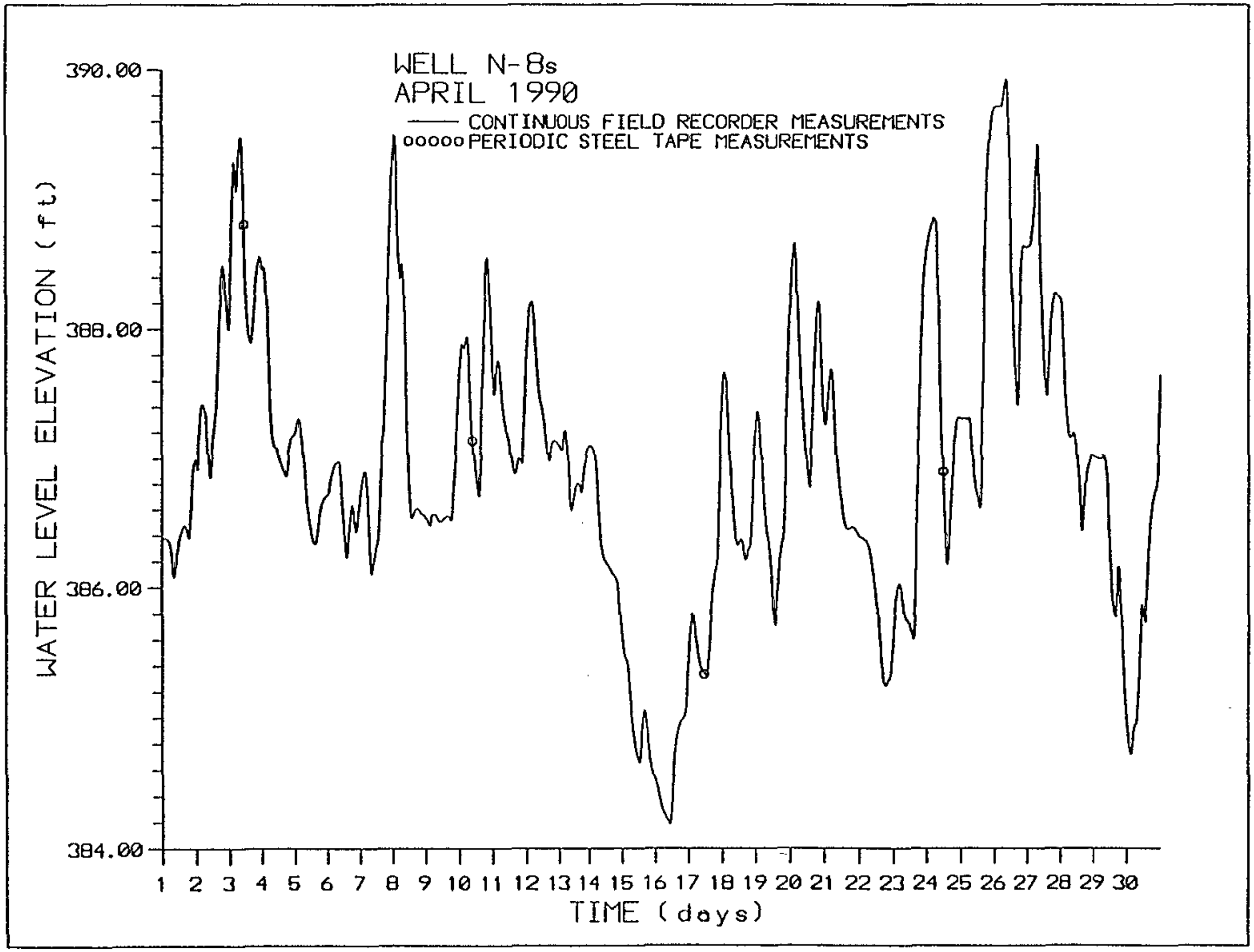
Well N-66 had 2 months of data collected for the period of this report. The data recorded were continuous and representative.

9413282.0029



A.3

9413282.0030



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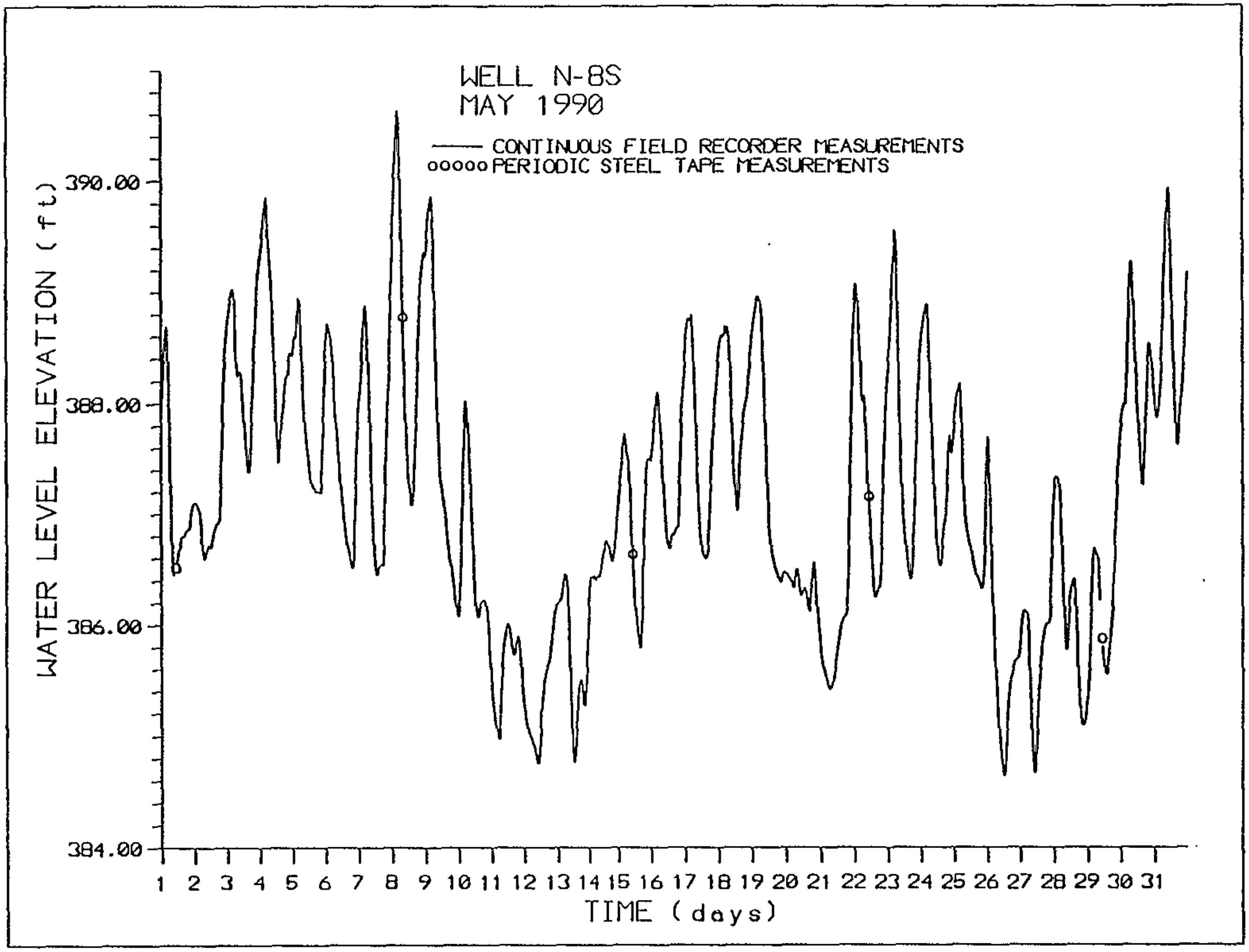
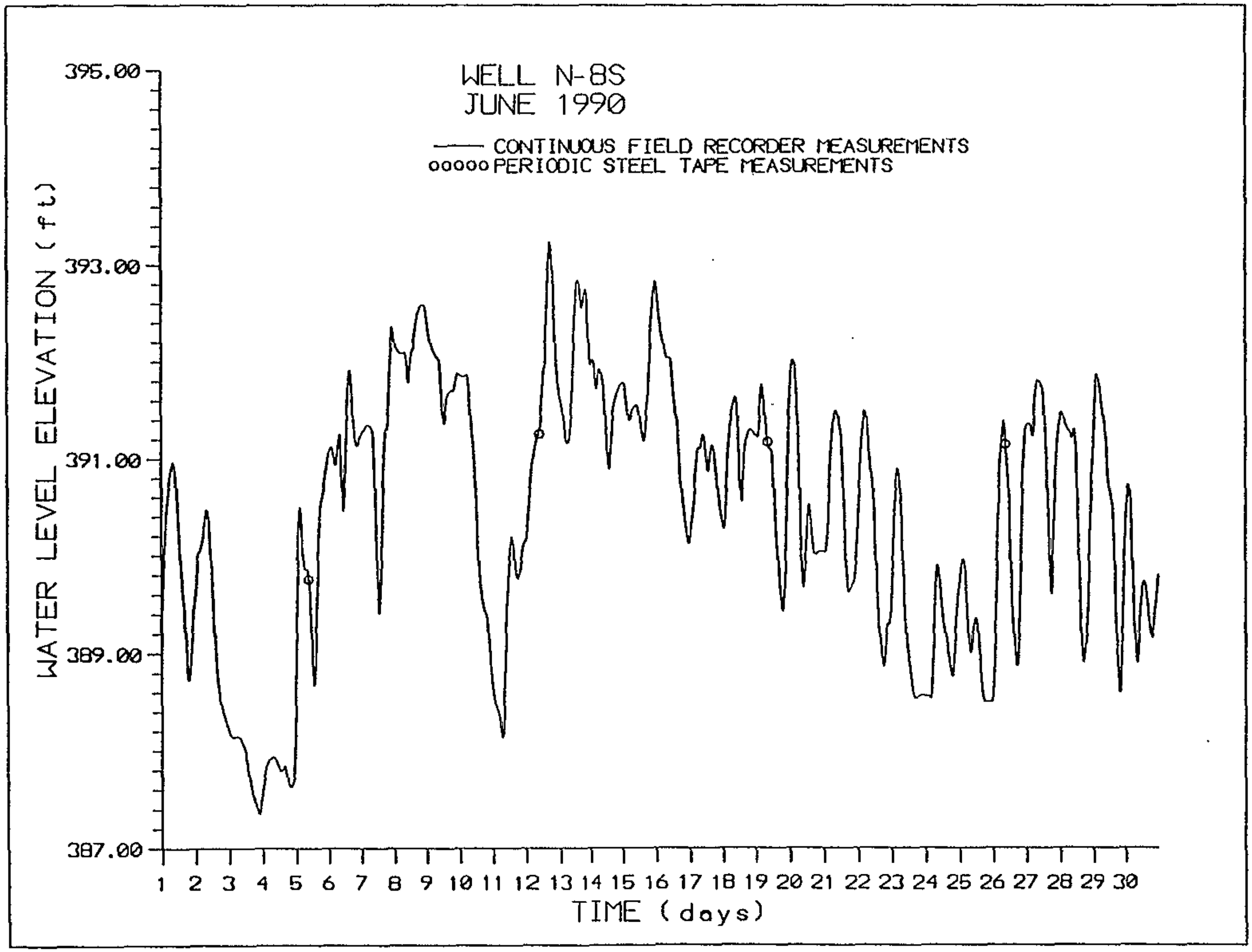
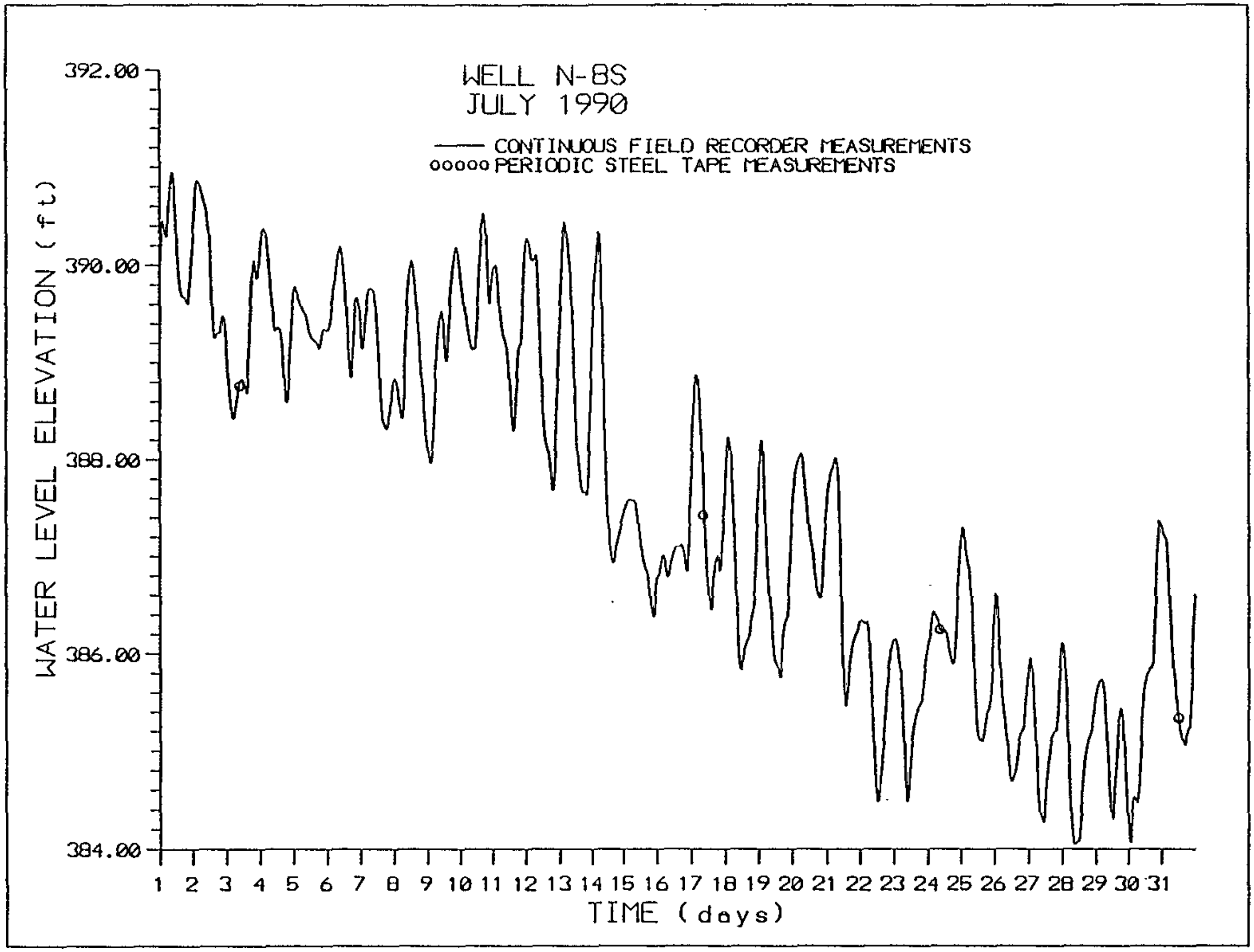
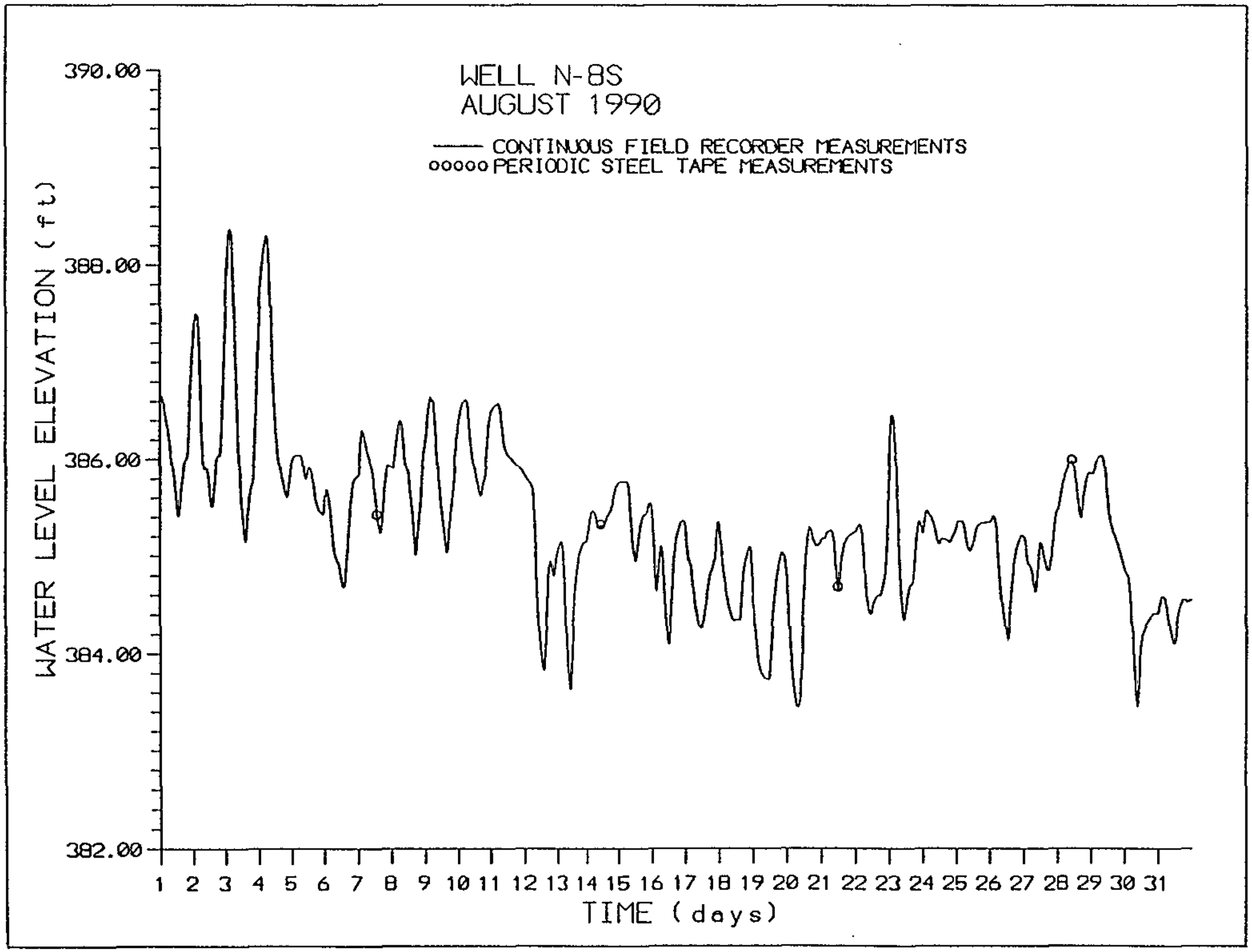
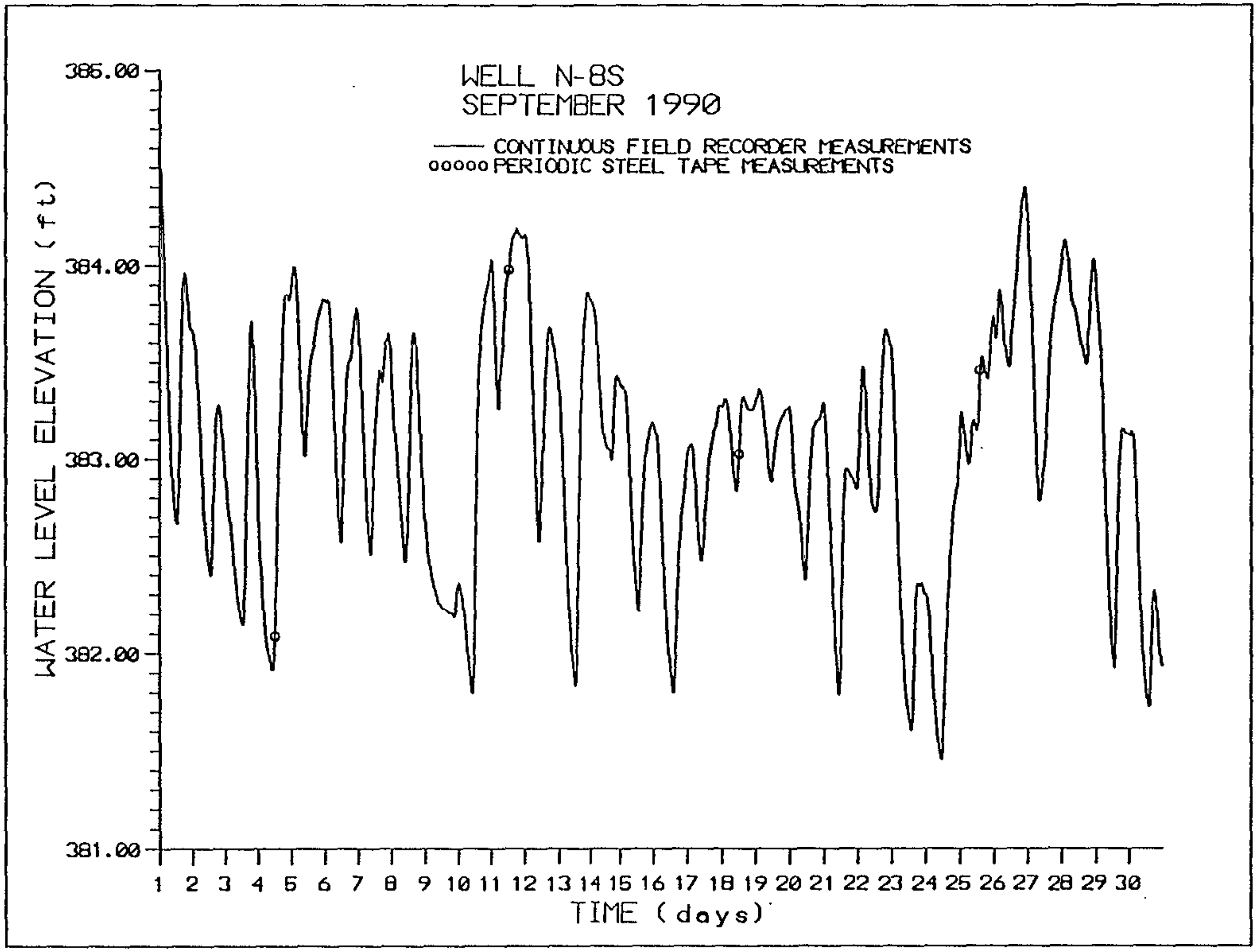

WELL N-8S
MAY 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
390.00
388.00
386.00
384.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

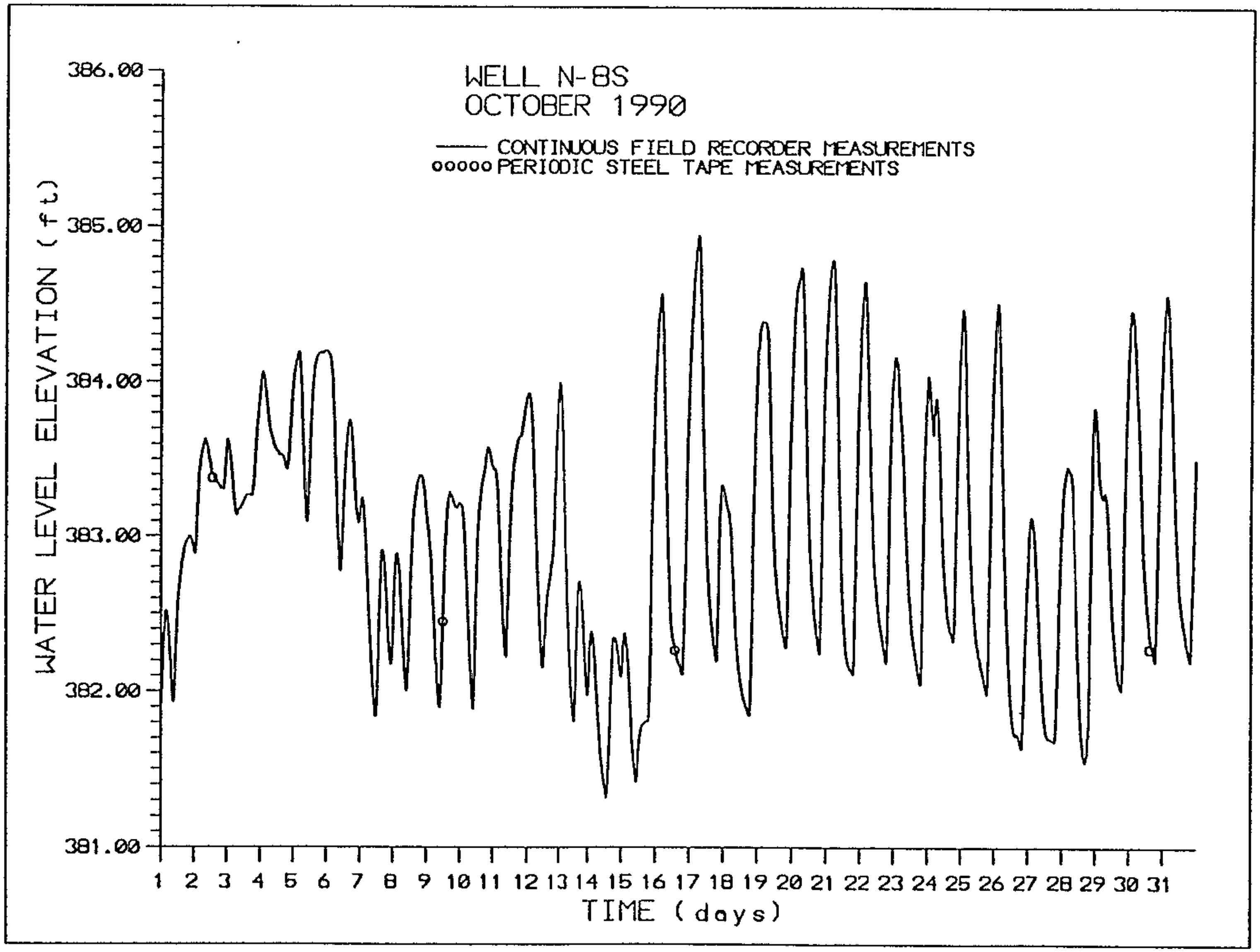

WELL N-8S
JUNE 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
395.00
393.00
391.00
389.00
387.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)

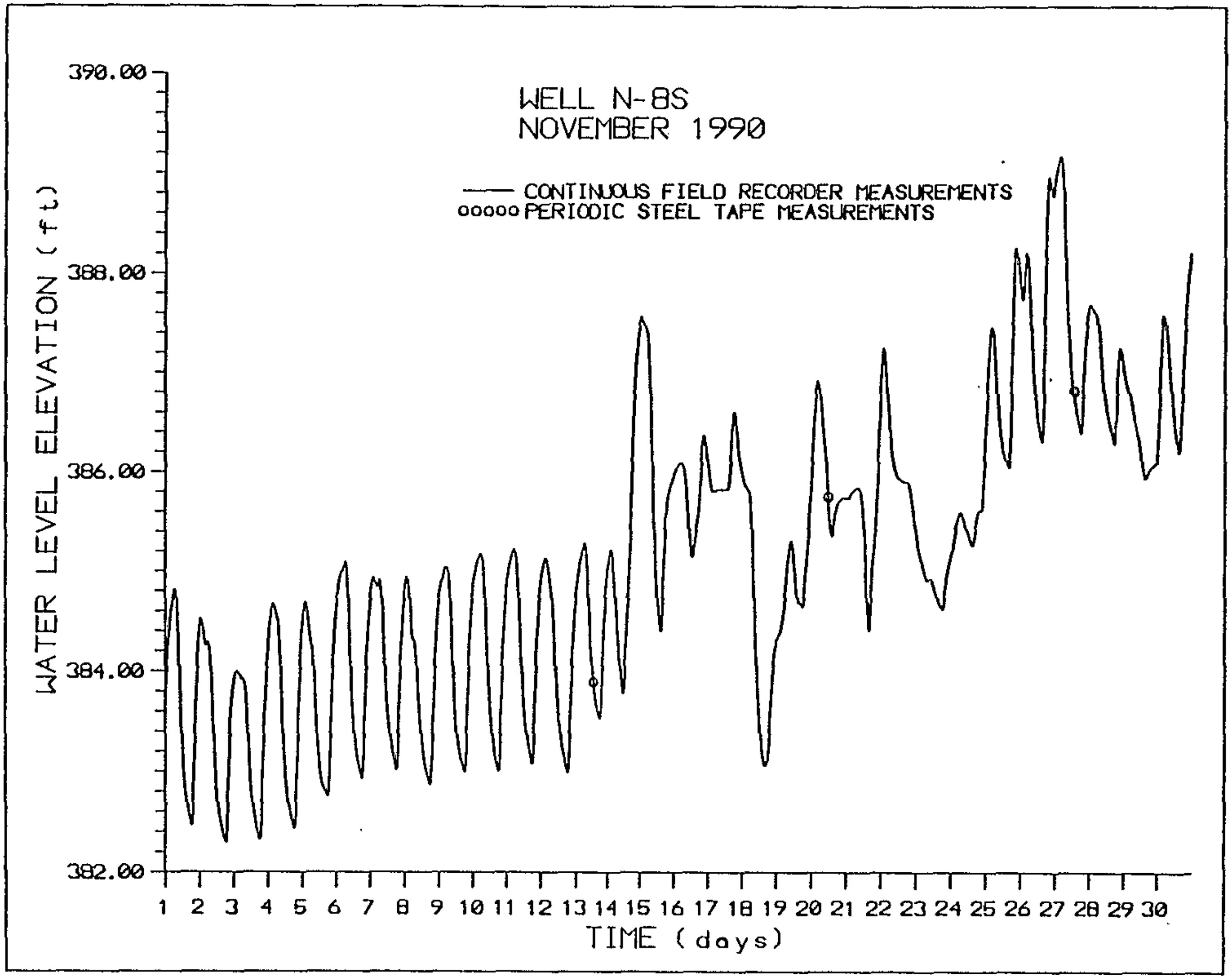

WELL N-8S
JULY 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
392.00
390.00
388.00
386.00
384.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)


WELL N-8S
AUGUST 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
390.00
388.00
386.00
384.00
382.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

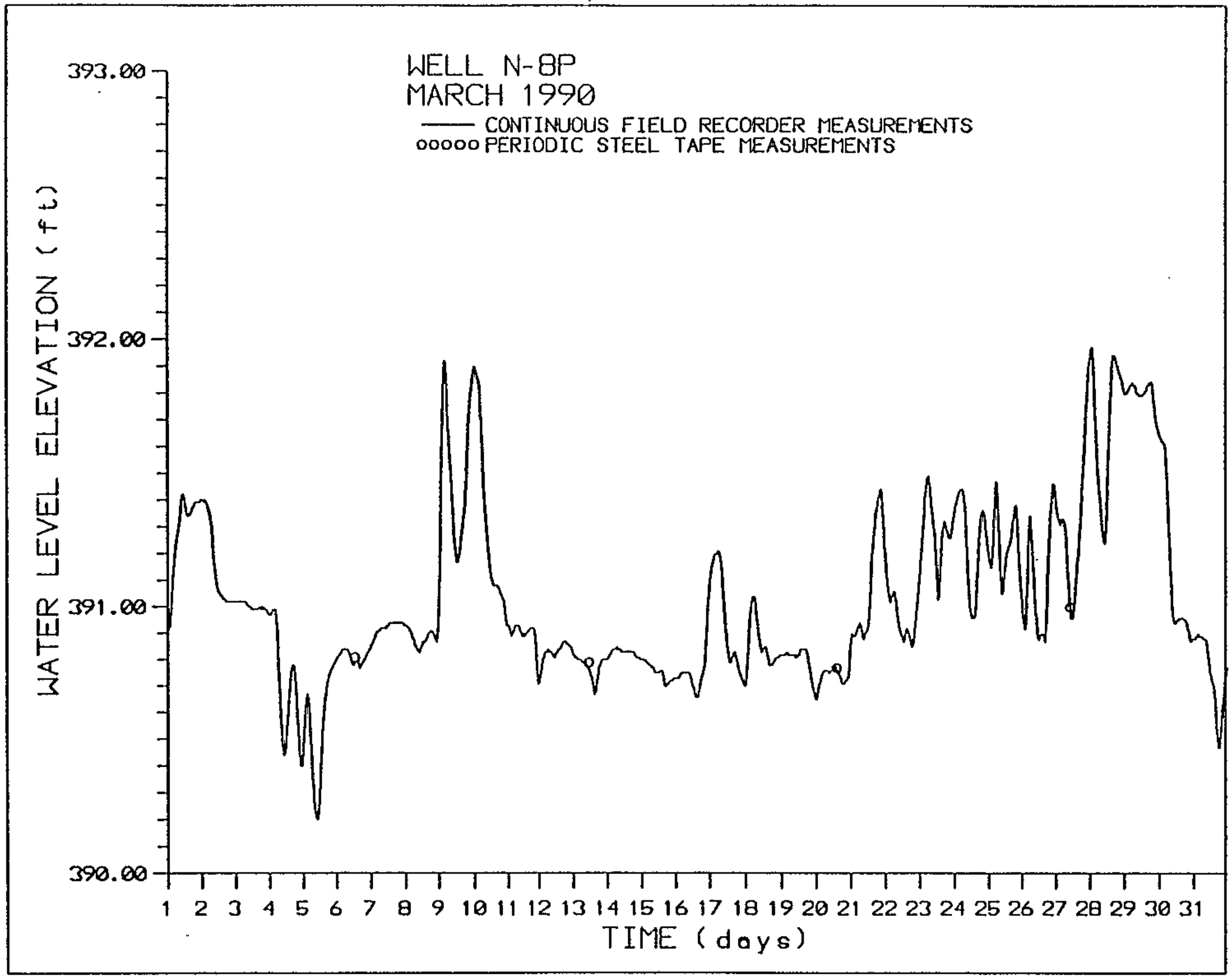
A.8


WELL N-8S
SEPTEMBER 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
385.00
384.00
383.00
382.00
381.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)

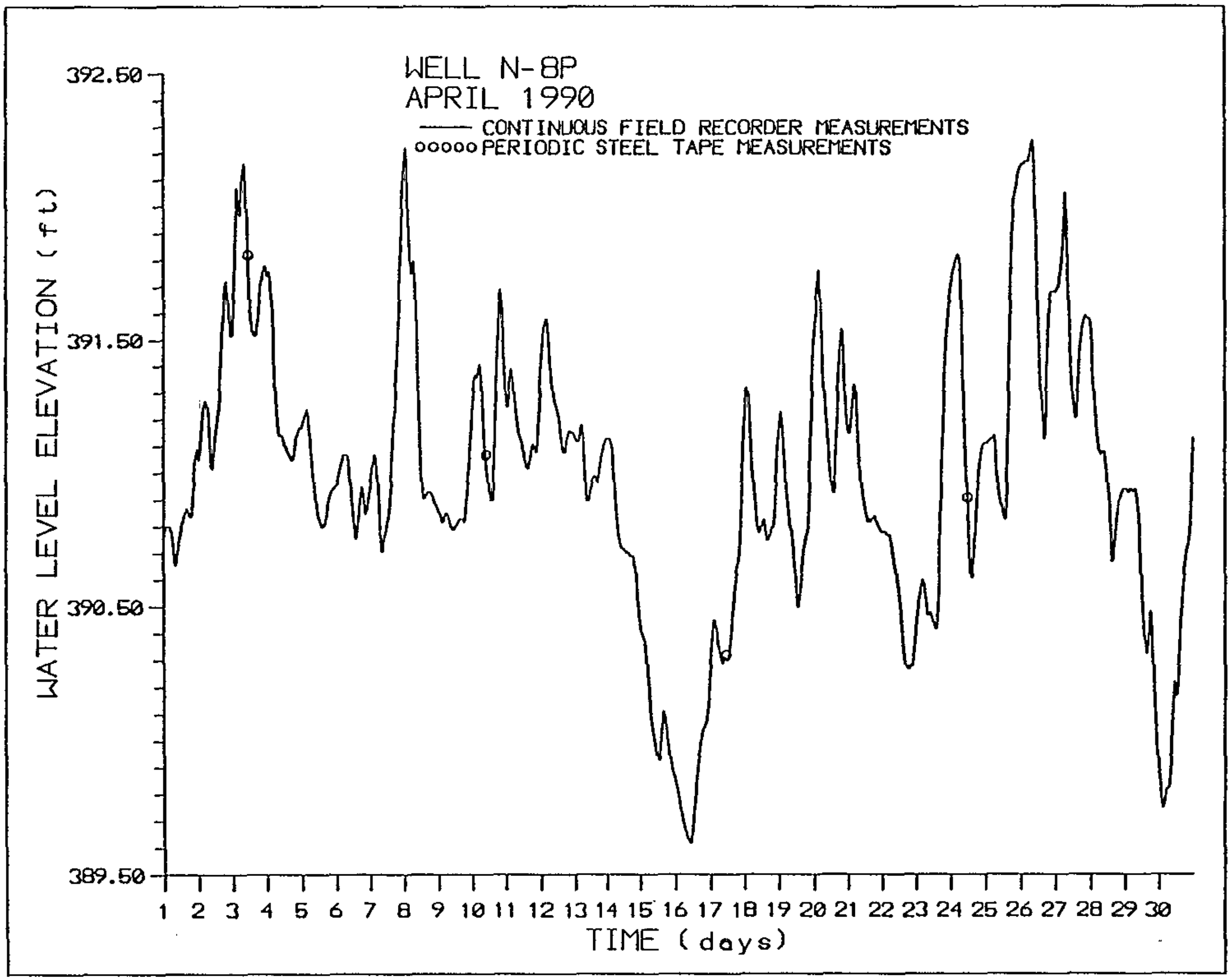

WELL N-8S
OCTOBER 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
386.00
385.00
384.00
383.00
382.00
381.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

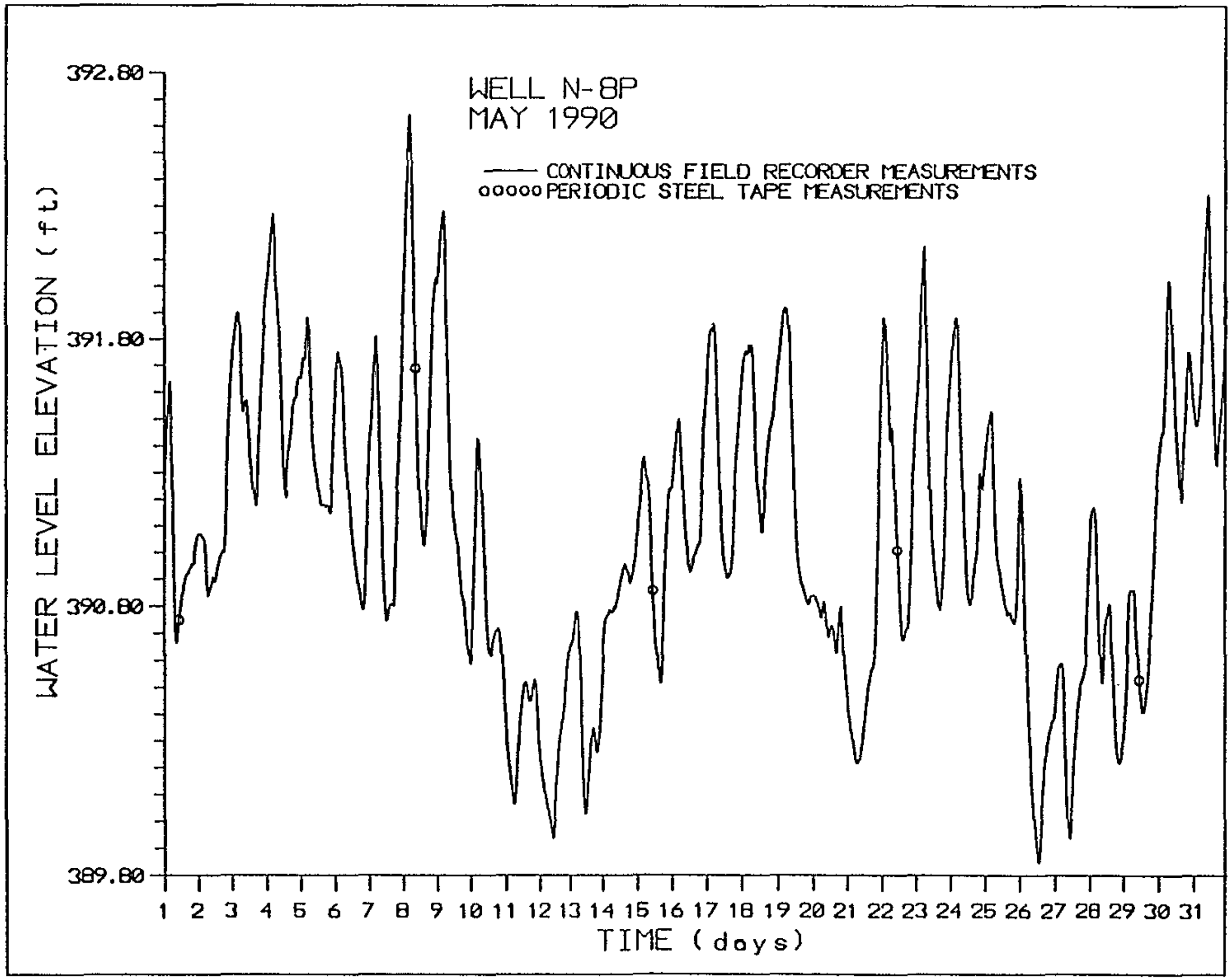


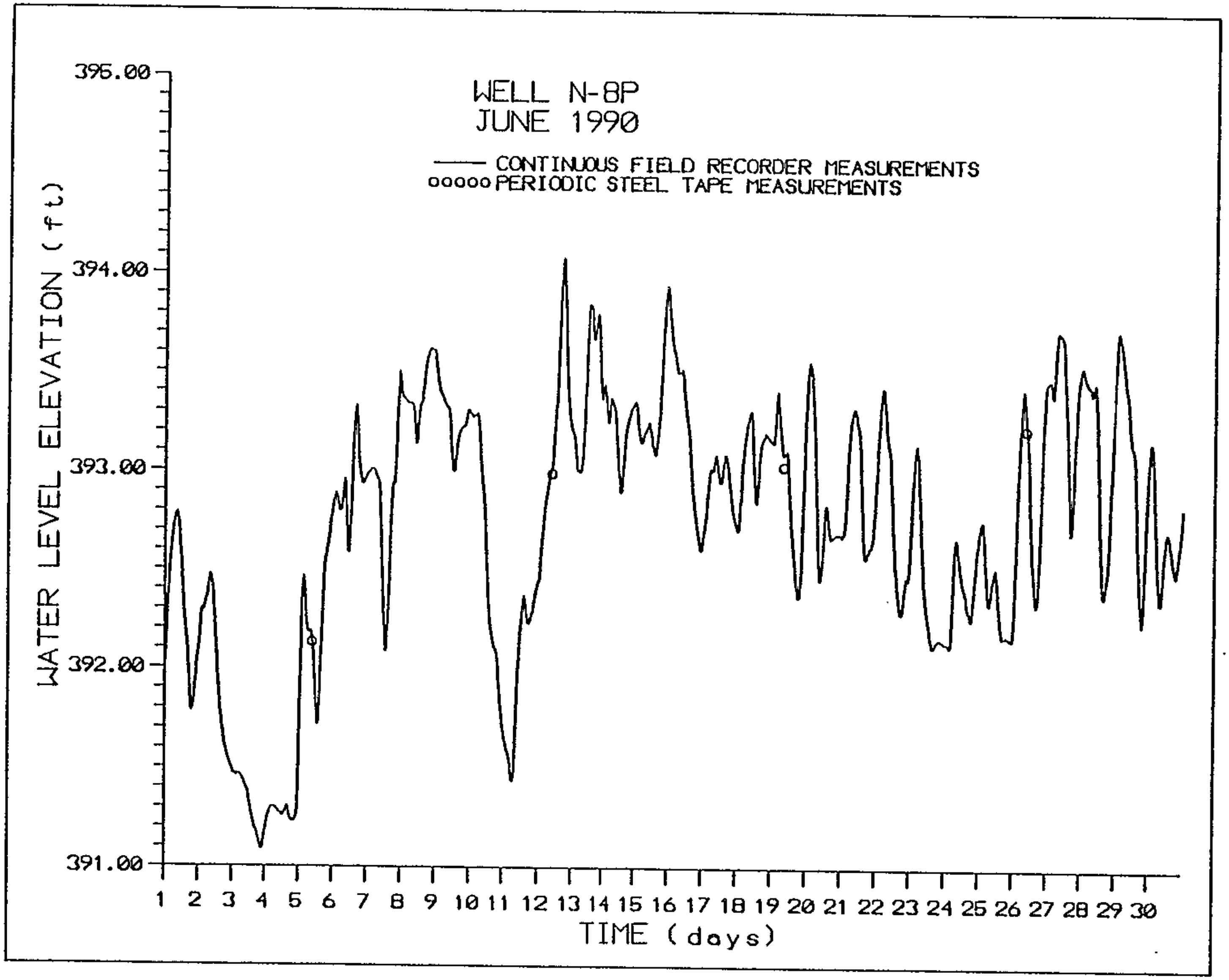
WELL N-8S
NOVEMBER 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
390.00
388.00
386.00
384.00
382.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)

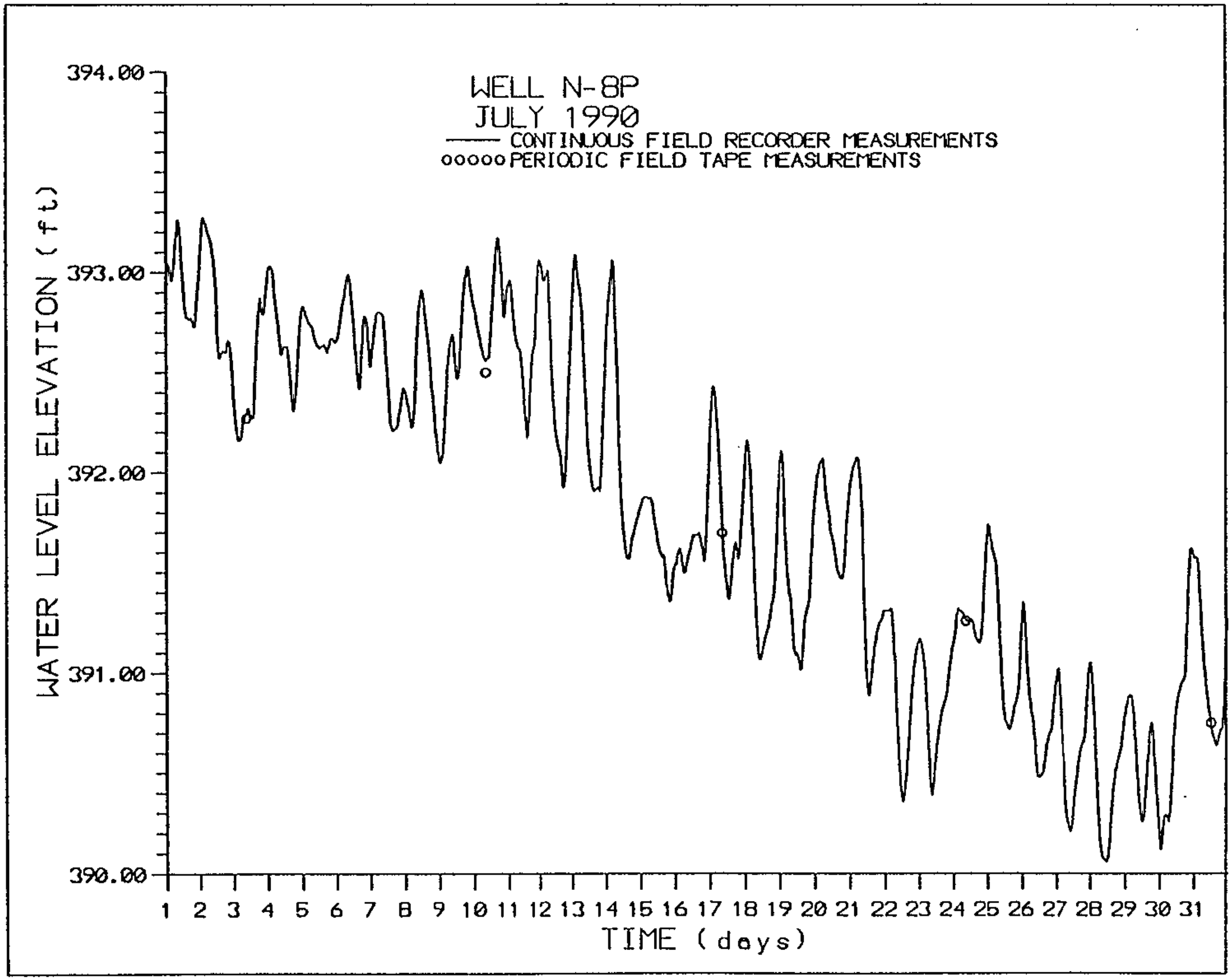

WELL N-8P
MARCH 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
393.00
392.00
391.00
390.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

9413282.0039

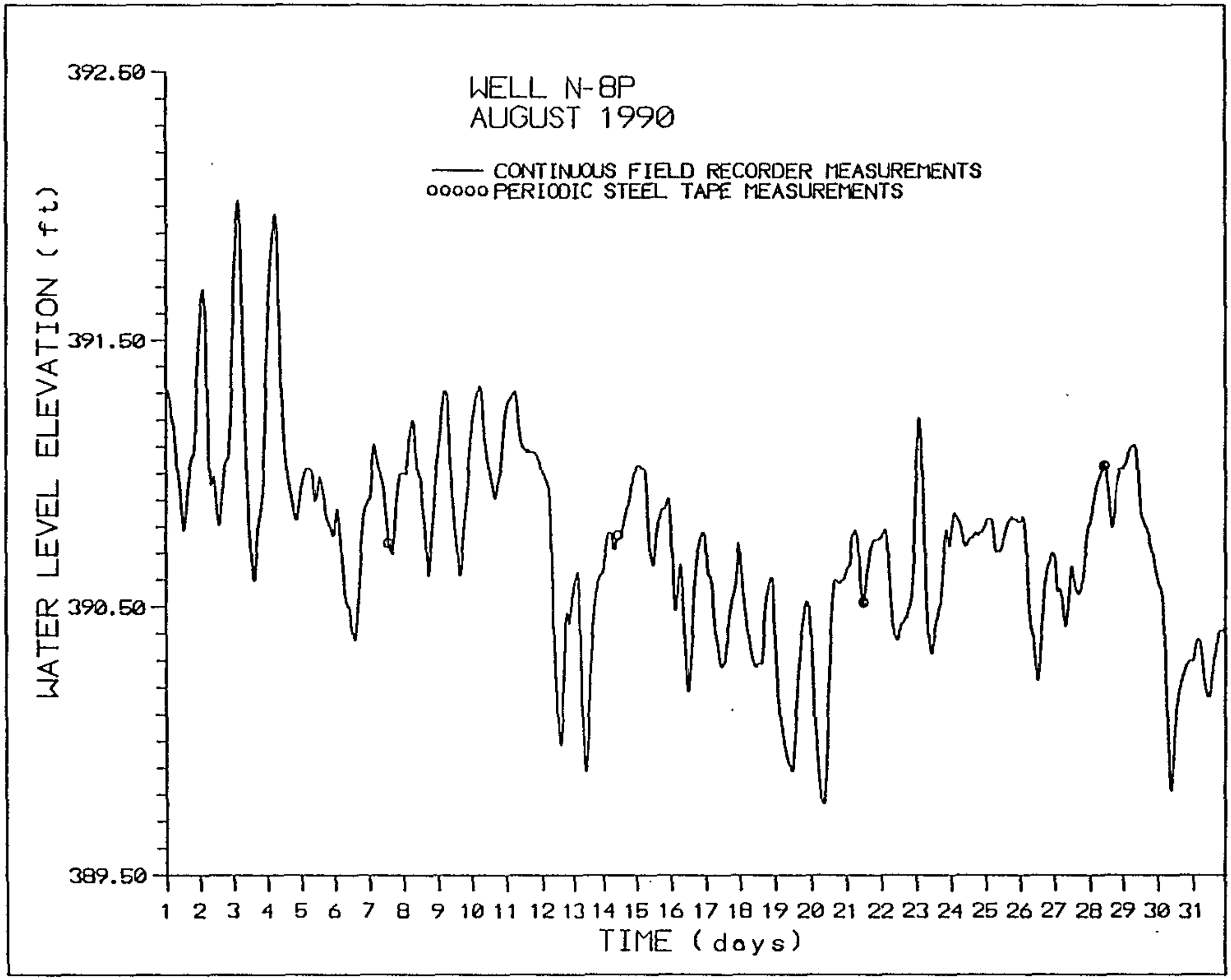



WELL N-8P
MAY 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
392.80
391.80
390.80
389.80
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)


WELL N-8P
JUNE 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
395.00
394.00
393.00
392.00
391.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)


WELL N-8P
JULY 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC FIELD TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
394.00
393.00
392.00
391.00
390.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

9413282.0043



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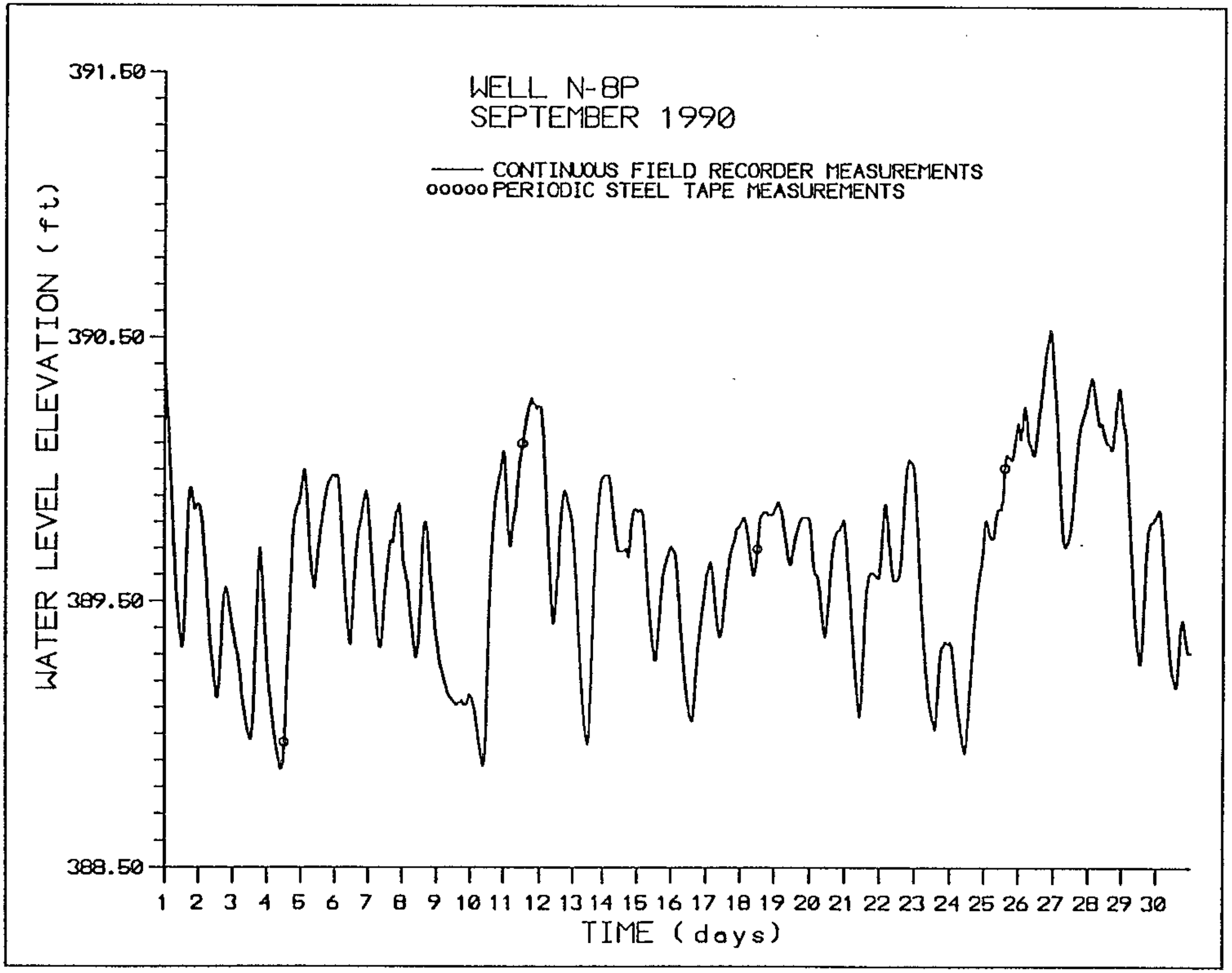
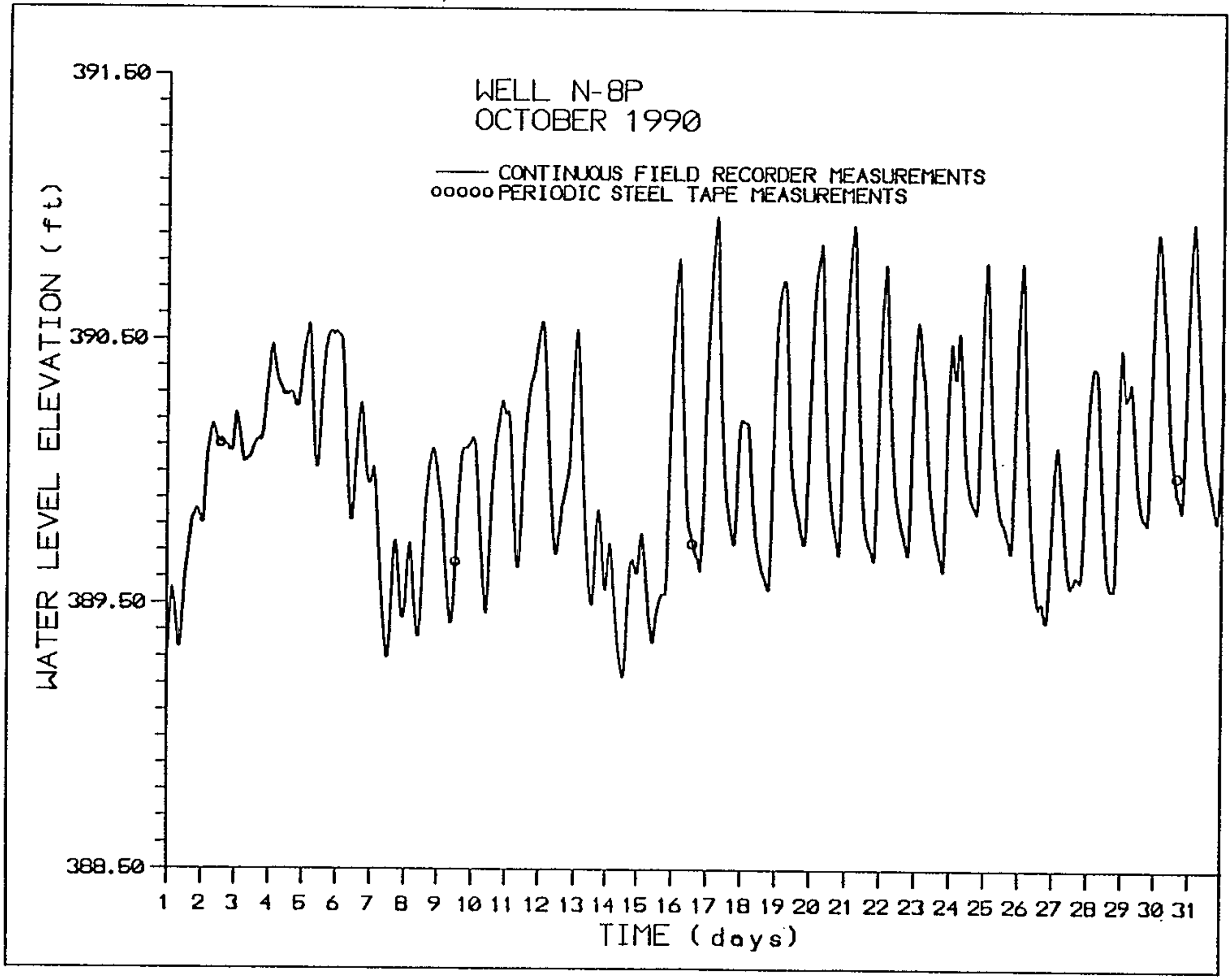
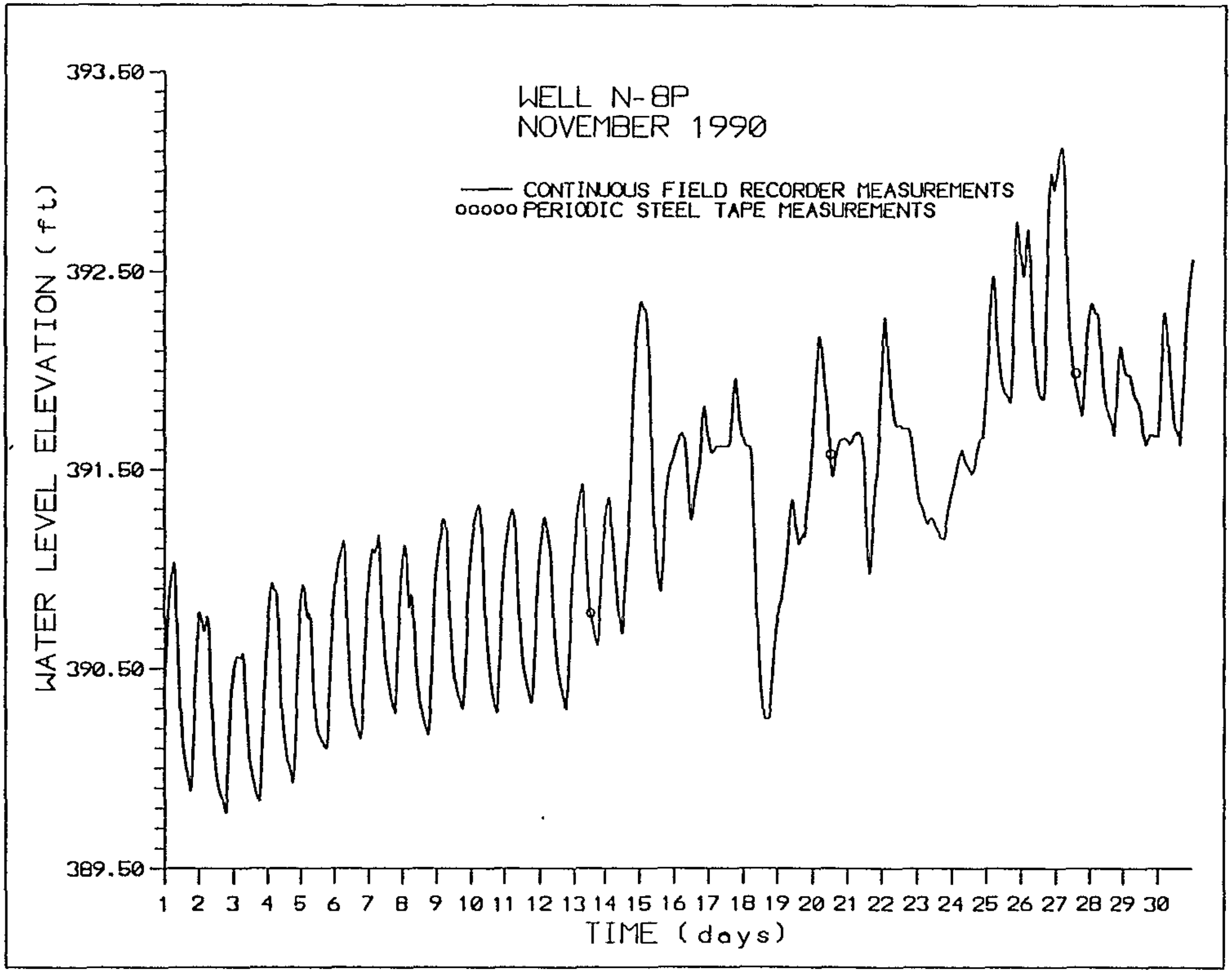
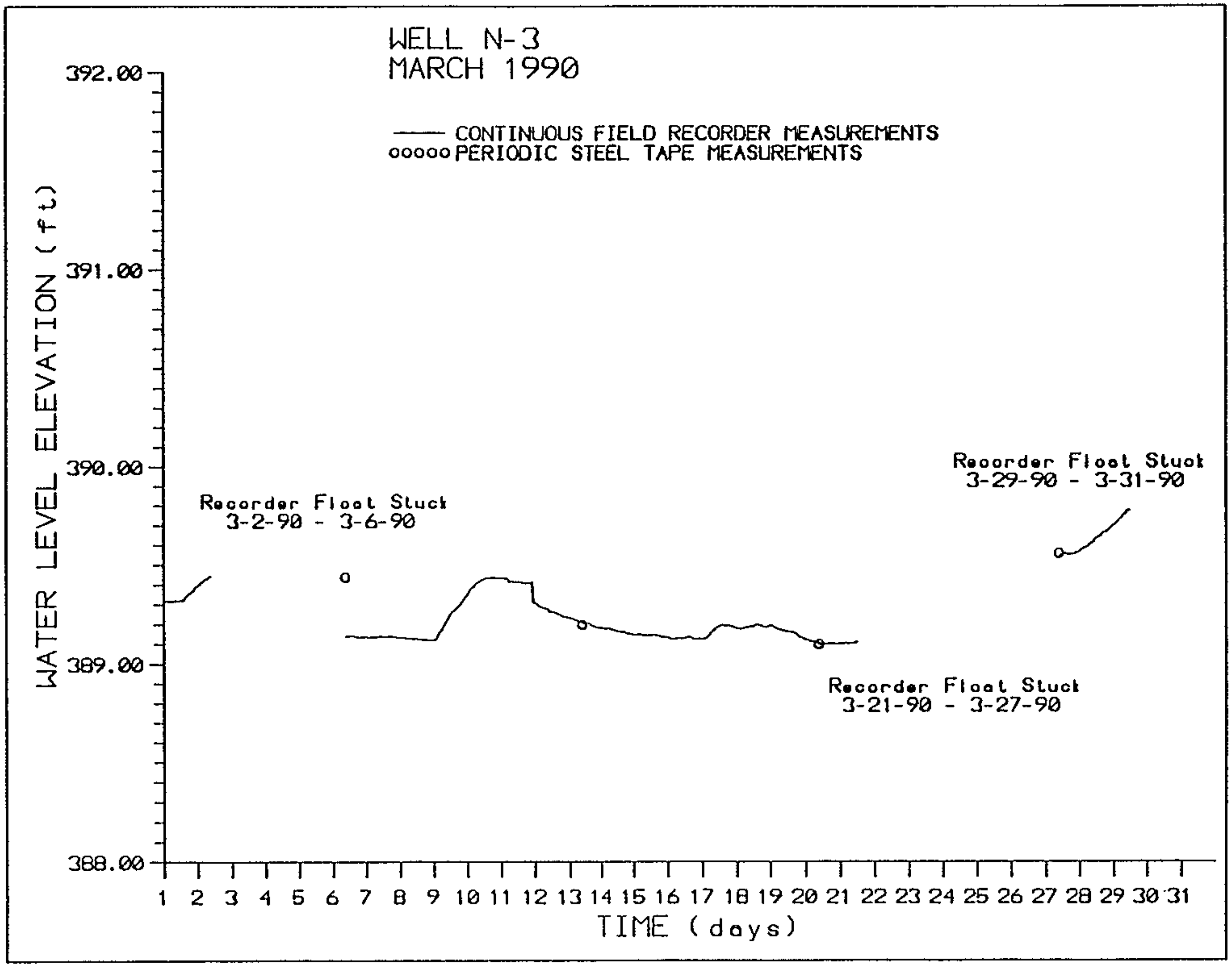
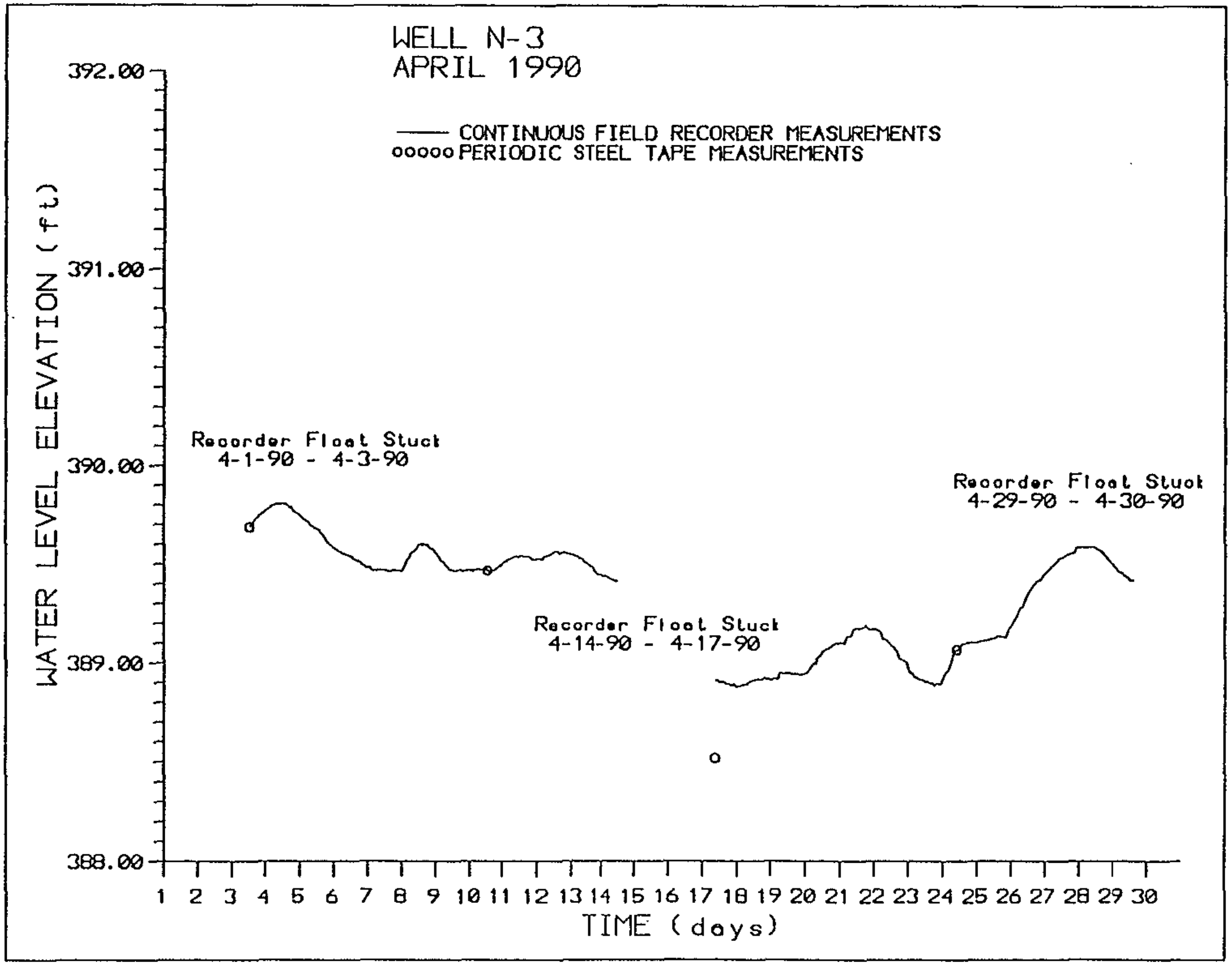
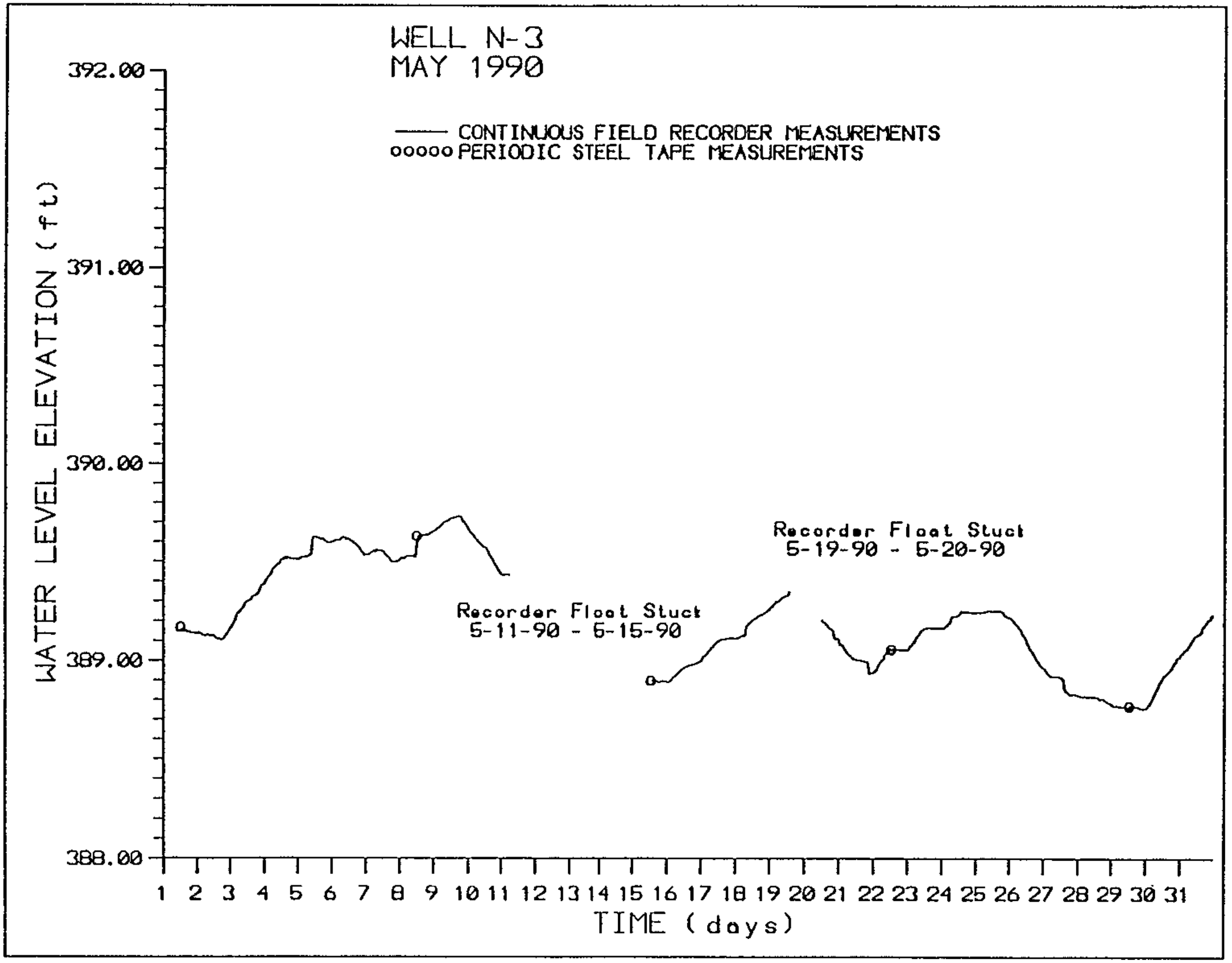


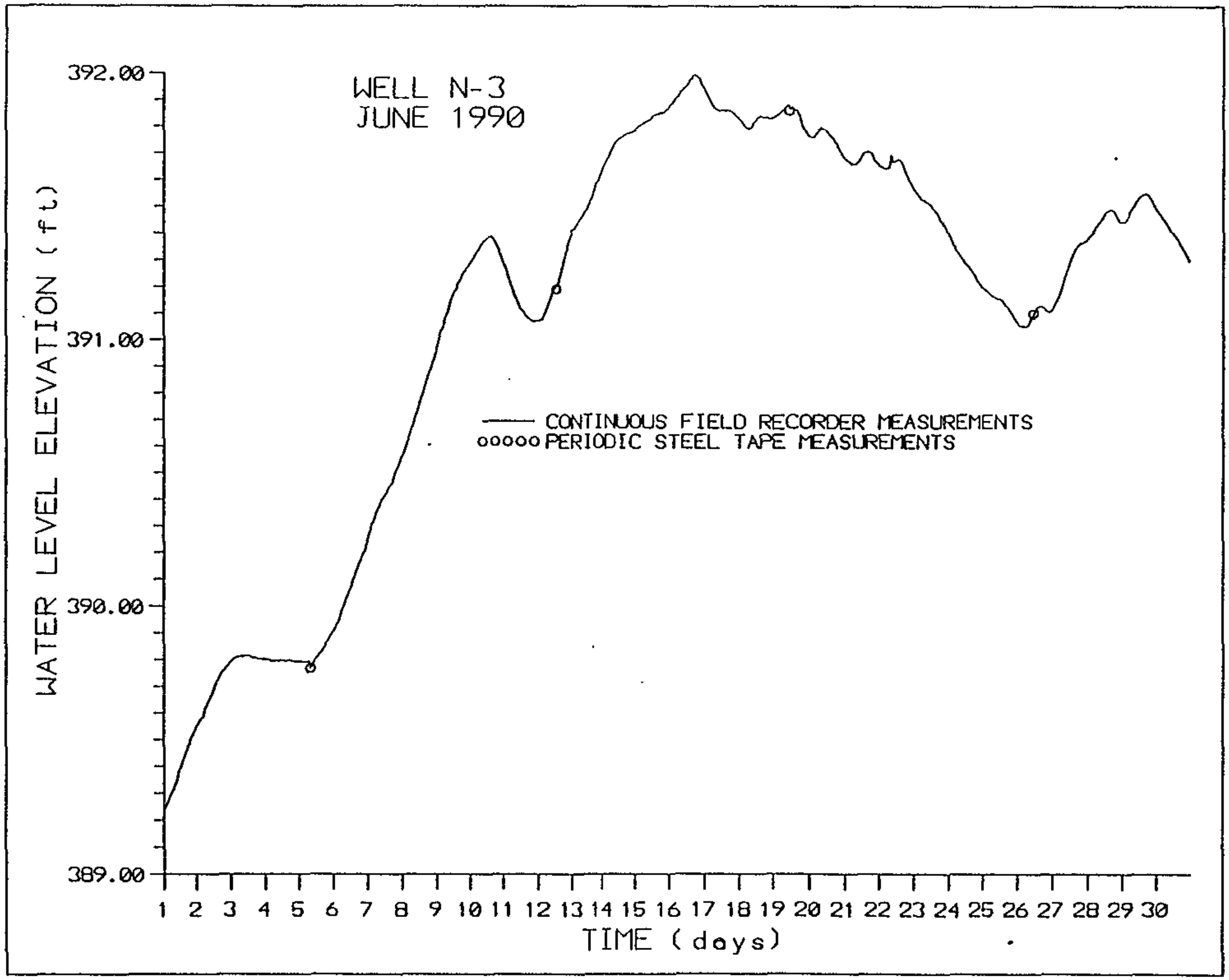

WELL N-8P
OCTOBER 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
391.50
390.50
389.50
388.50
WATER LEVEL ELEVATION (ft)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

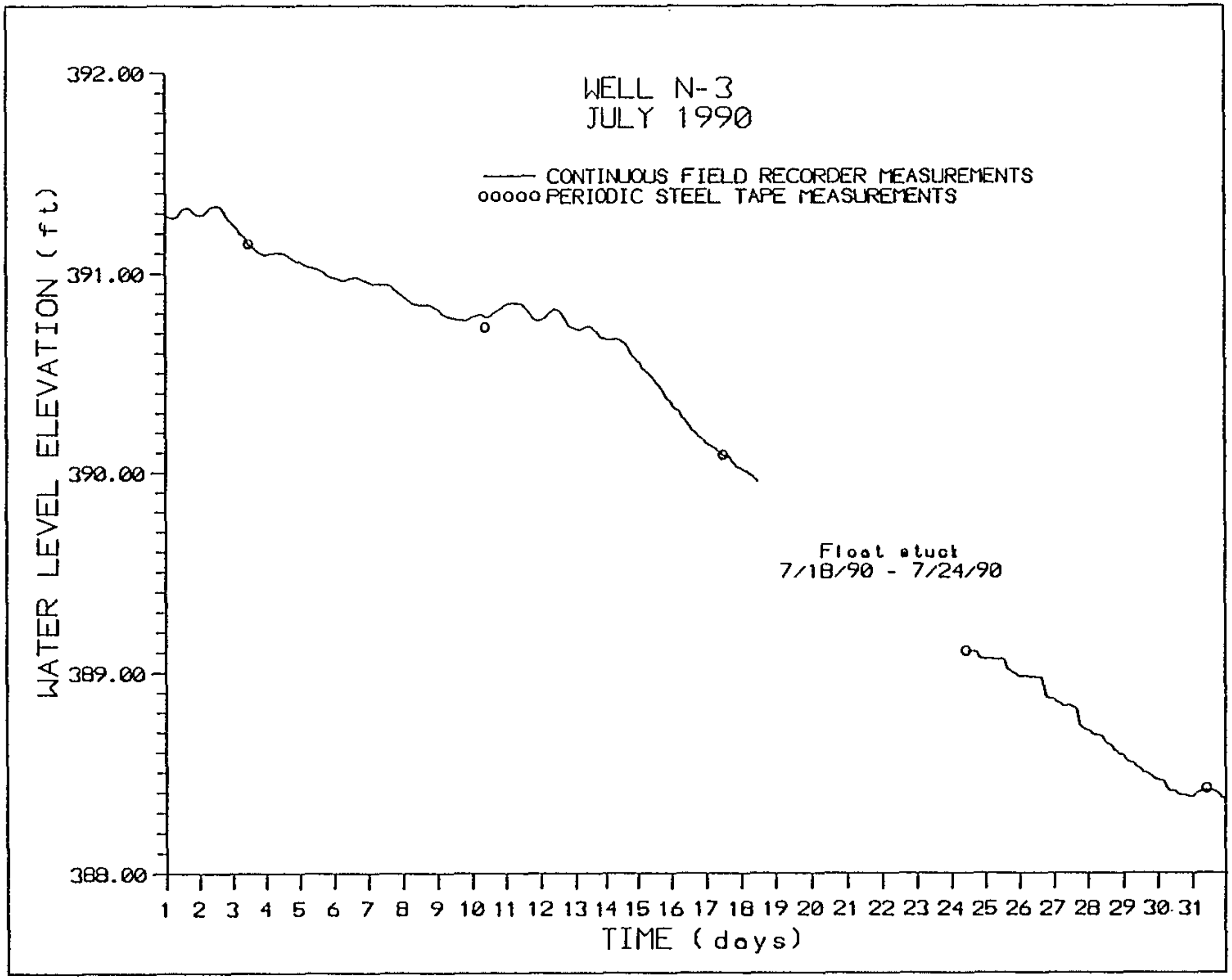

WELL N-8P
NOVEMBER 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
393.50
392.50
391.50
390.50
389.50
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)


WELL N-3
MARCH 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
Recorder Float Stuck
3-2-90 - 3-6-90
Recorder Float Stuck
3-21-90 - 3-27-90
Recorder Float Stuck
3-29-90 - 3-31-90
WATER LEVEL ELEVATION (ft)
392.00
391.00
390.00
389.00
388.00
TIME (days)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

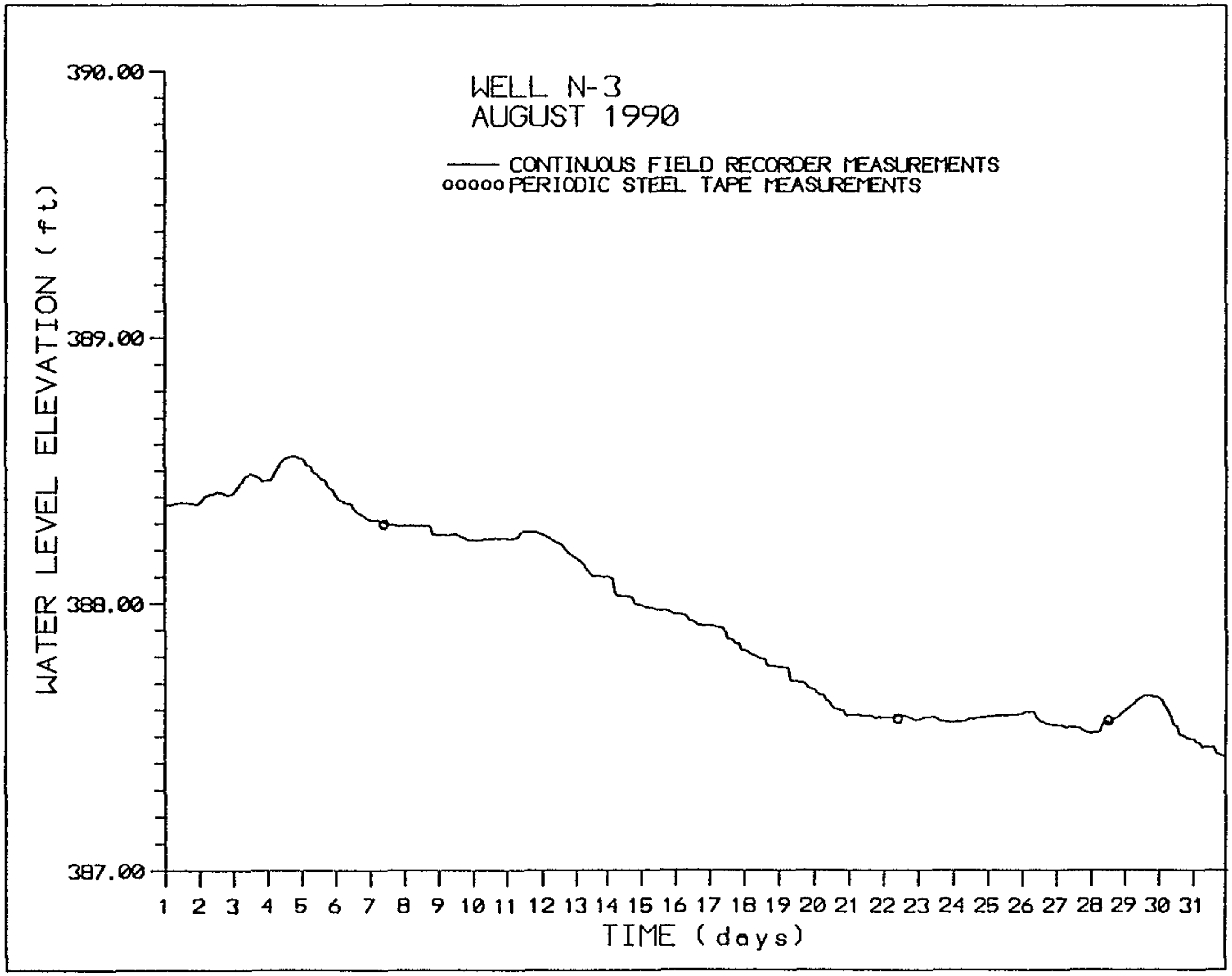

WELL N-3
APRIL 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
Recorder Float Stuck
4-1-90 - 4-3-90
Recorder Float Stuck
4-14-90 - 4-17-90
Recorder Float Stuck
4-29-90 - 4-30-90
WATER LEVEL ELEVATION (ft)
392.00
391.00
390.00
389.00
388.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)

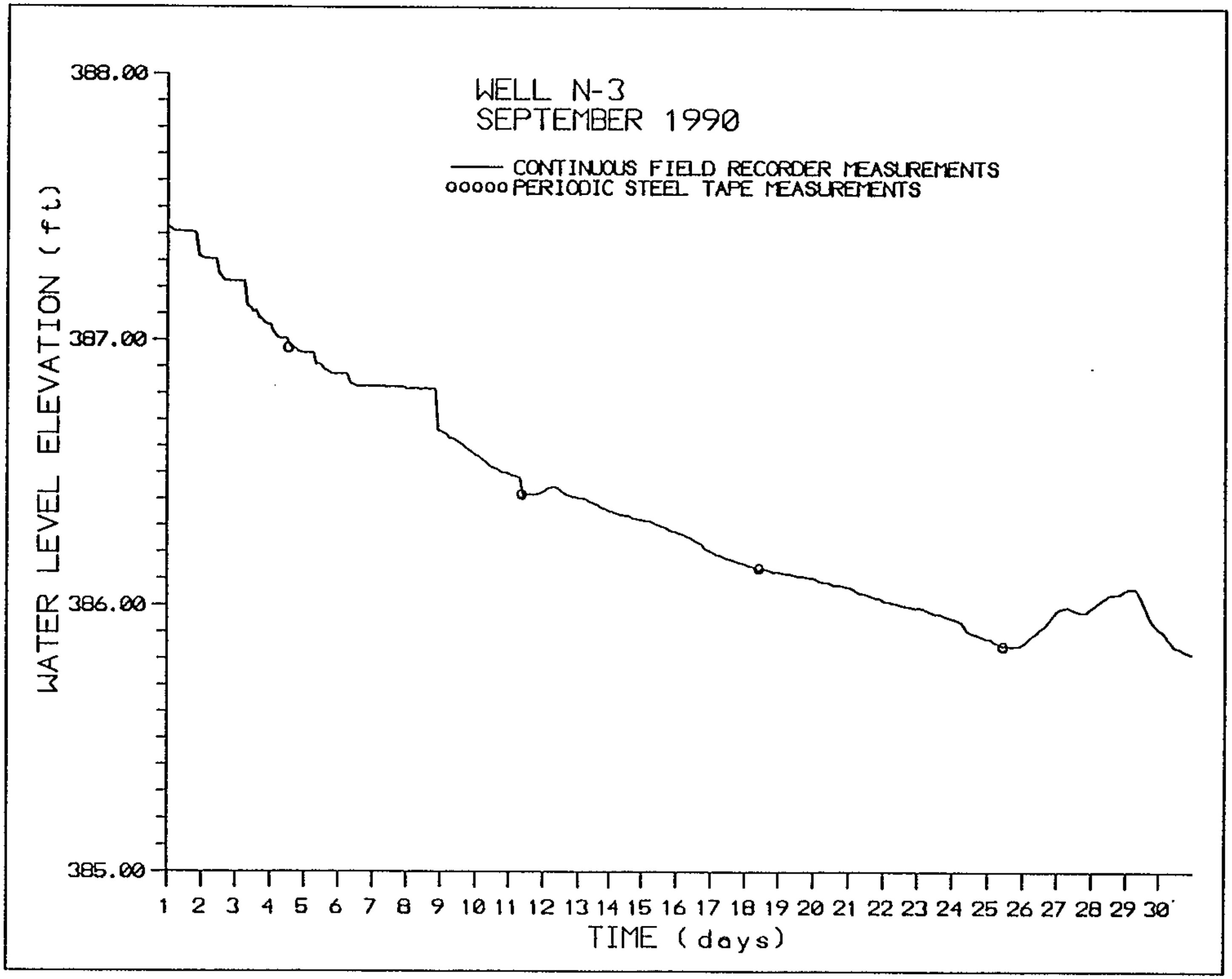

WELL N-3
MAY 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
392.00
391.00
390.00
389.00
388.00
Recorder Float Stuck
5-11-90 - 5-15-90
Recorder Float Stuck
5-19-90 - 5-20-90
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

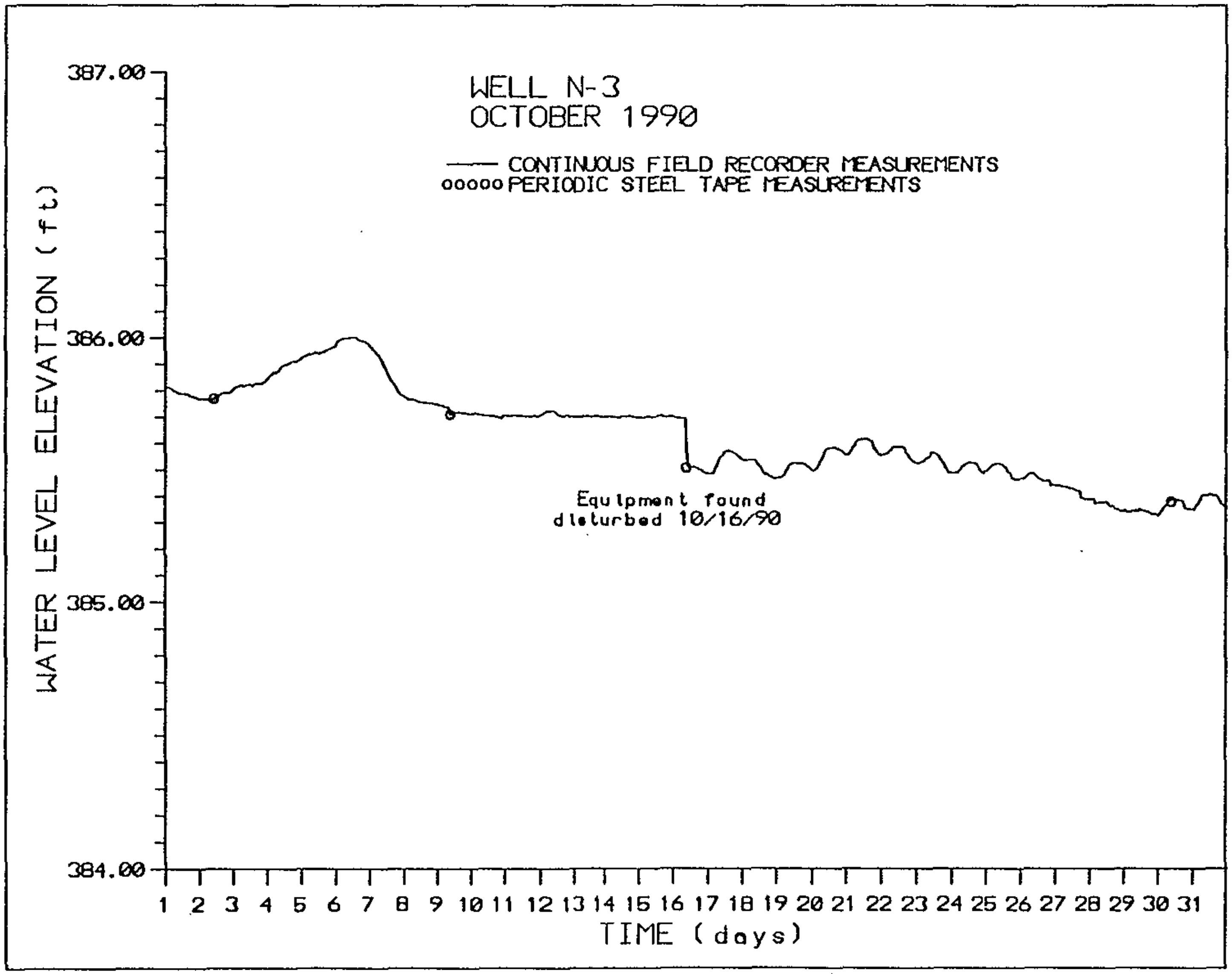

WELL N-3
JUNE 1990
WATER LEVEL ELEVATION (ft)
392.00
391.00
390.00
389.00
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)

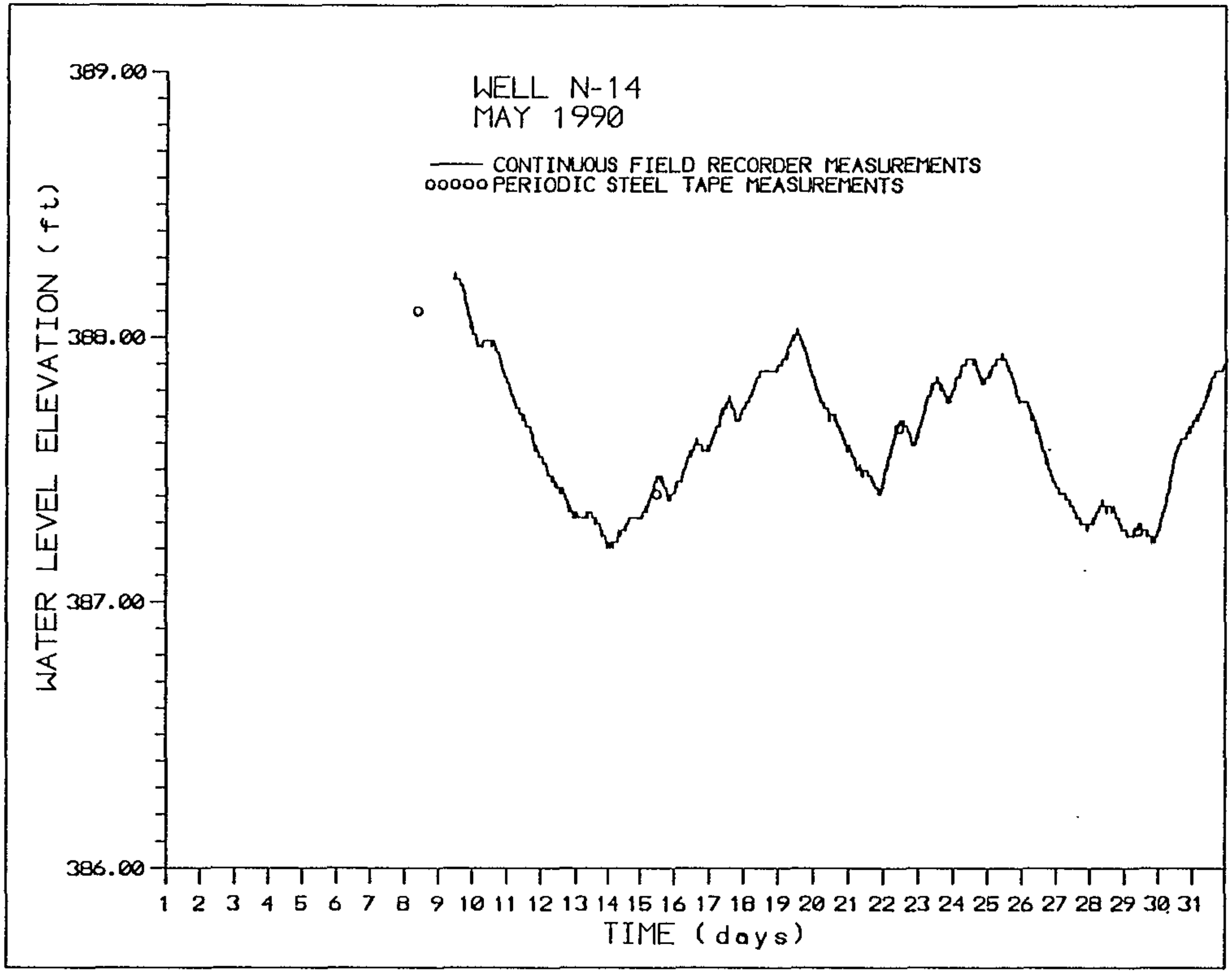

WELL N-3
JULY 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
Float stuck
7/18/90 - 7/24/90
WATER LEVEL ELEVATION (ft)
392.00
391.00
390.00
389.00
388.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

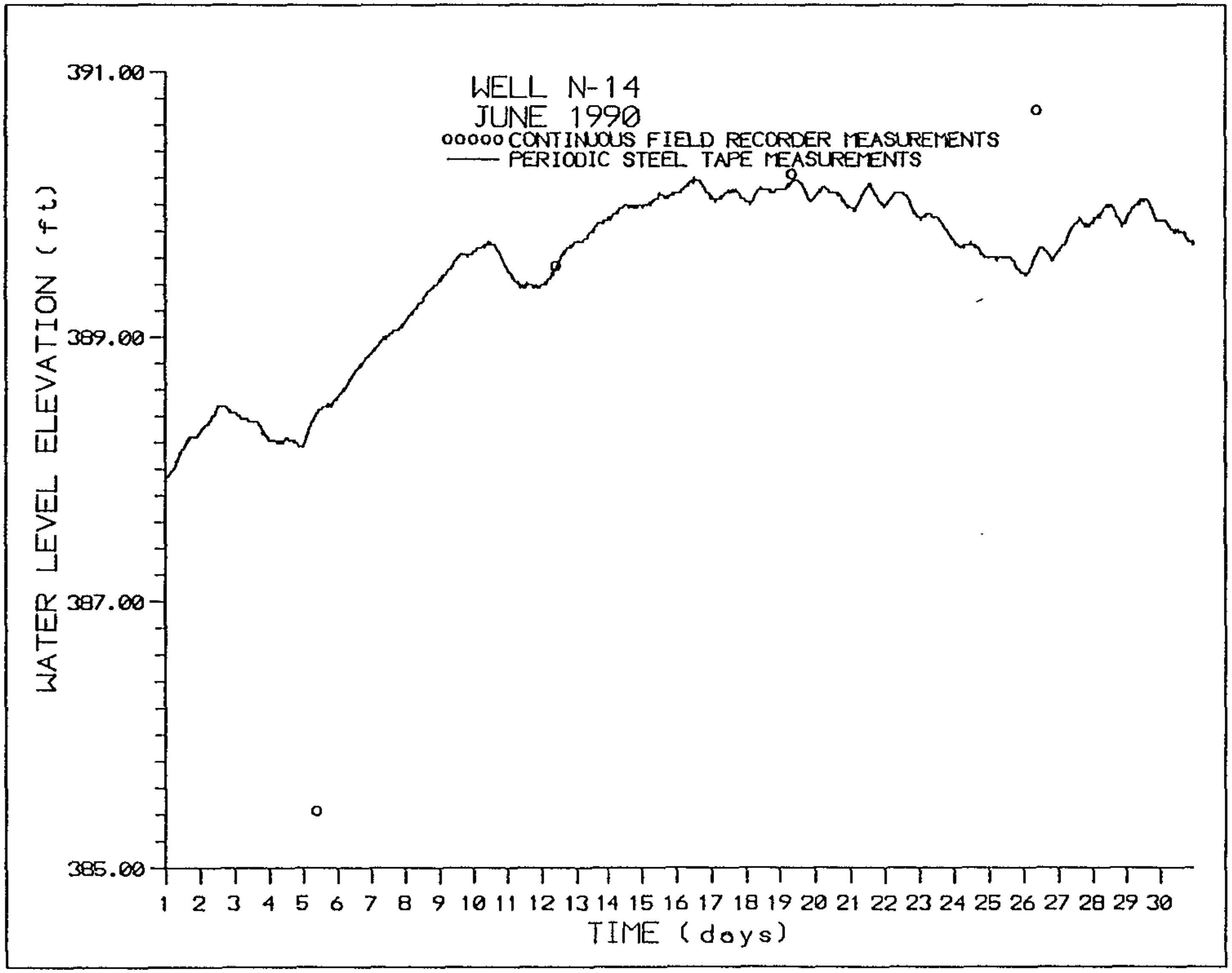
9413282.0052

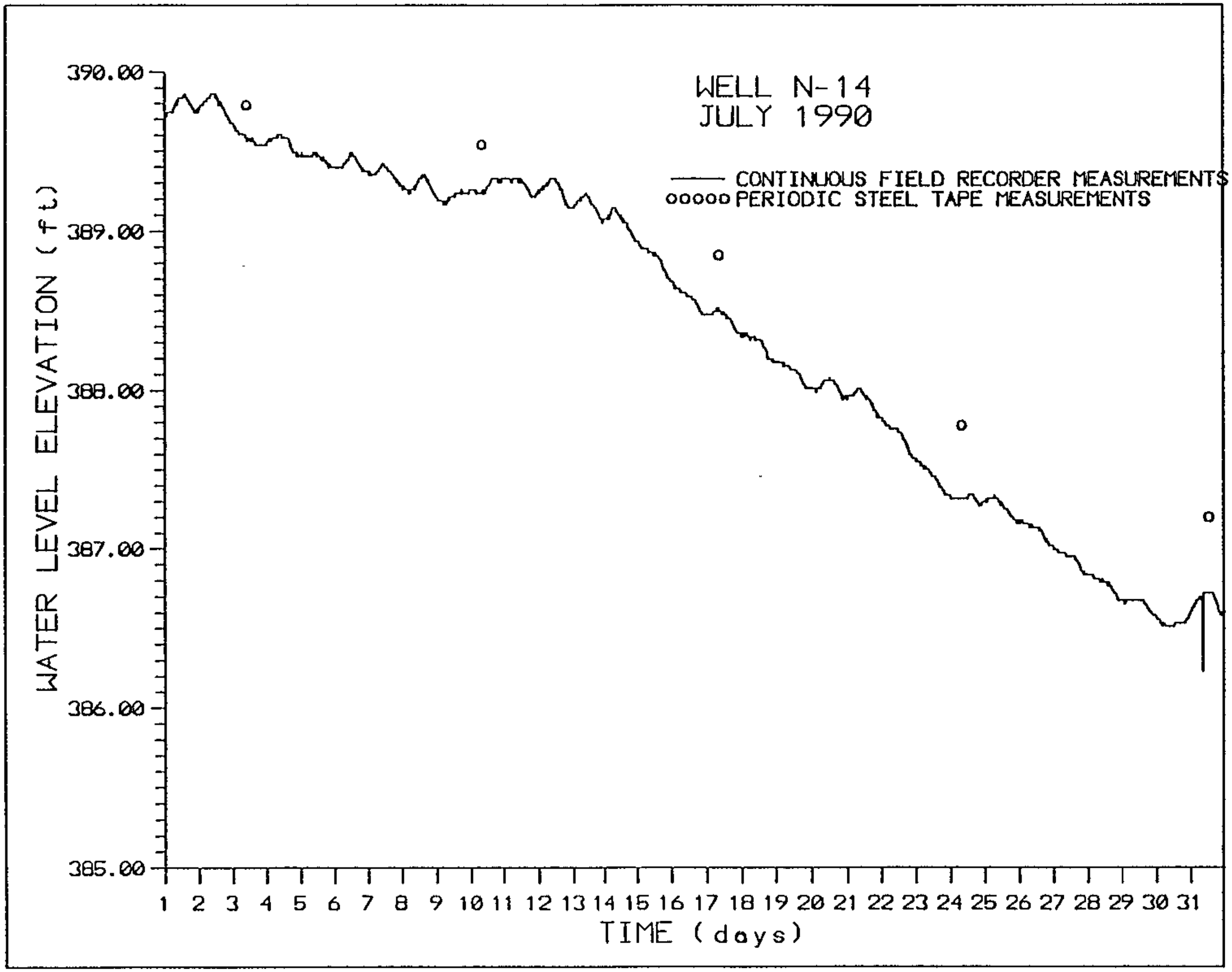


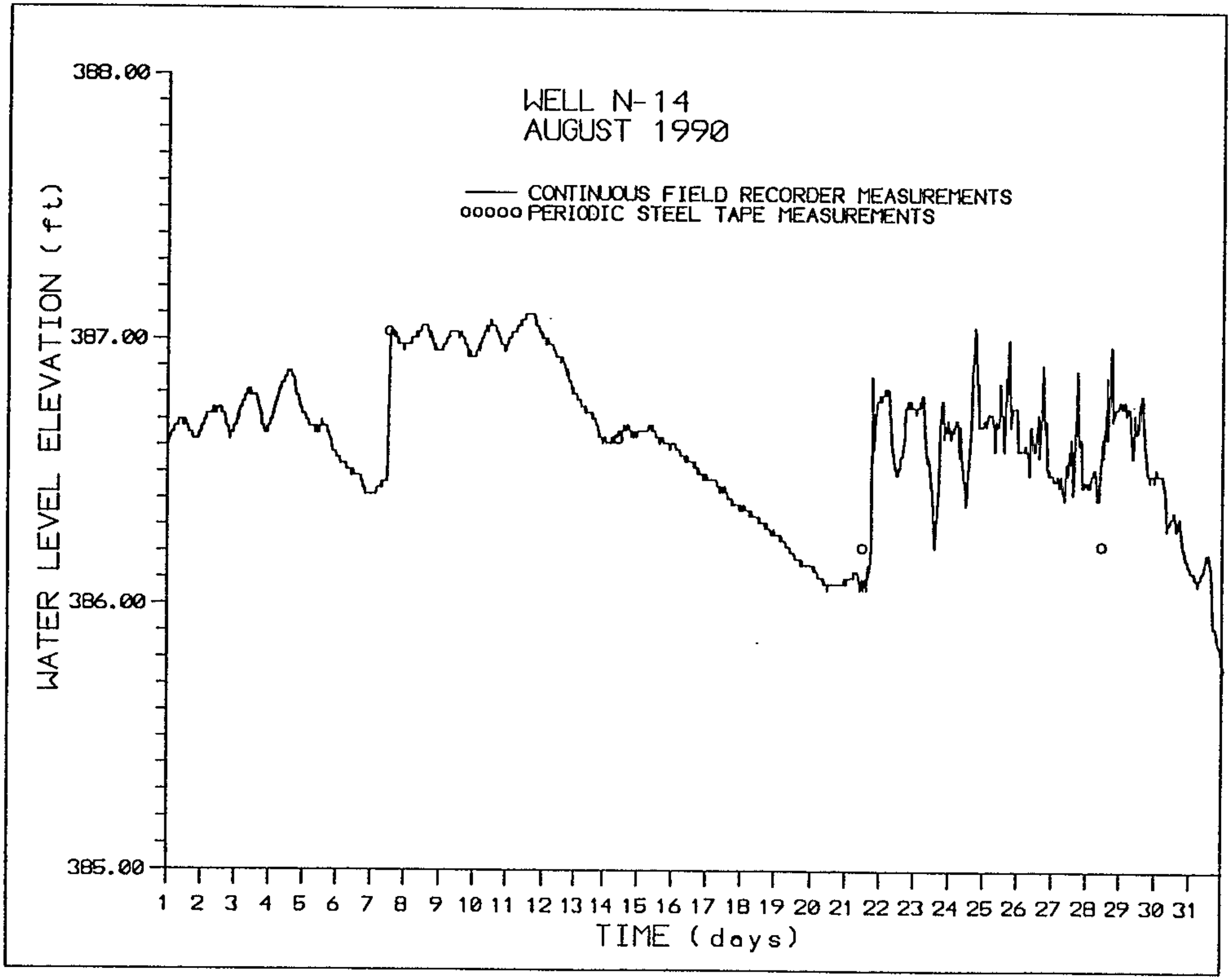

WELL N-3
SEPTEMBER 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
388.00
387.00
386.00
385.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)


WELL N-3
OCTOBER 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
387.00
386.00
385.00
384.00
Equipment found disturbed 10/16/90
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

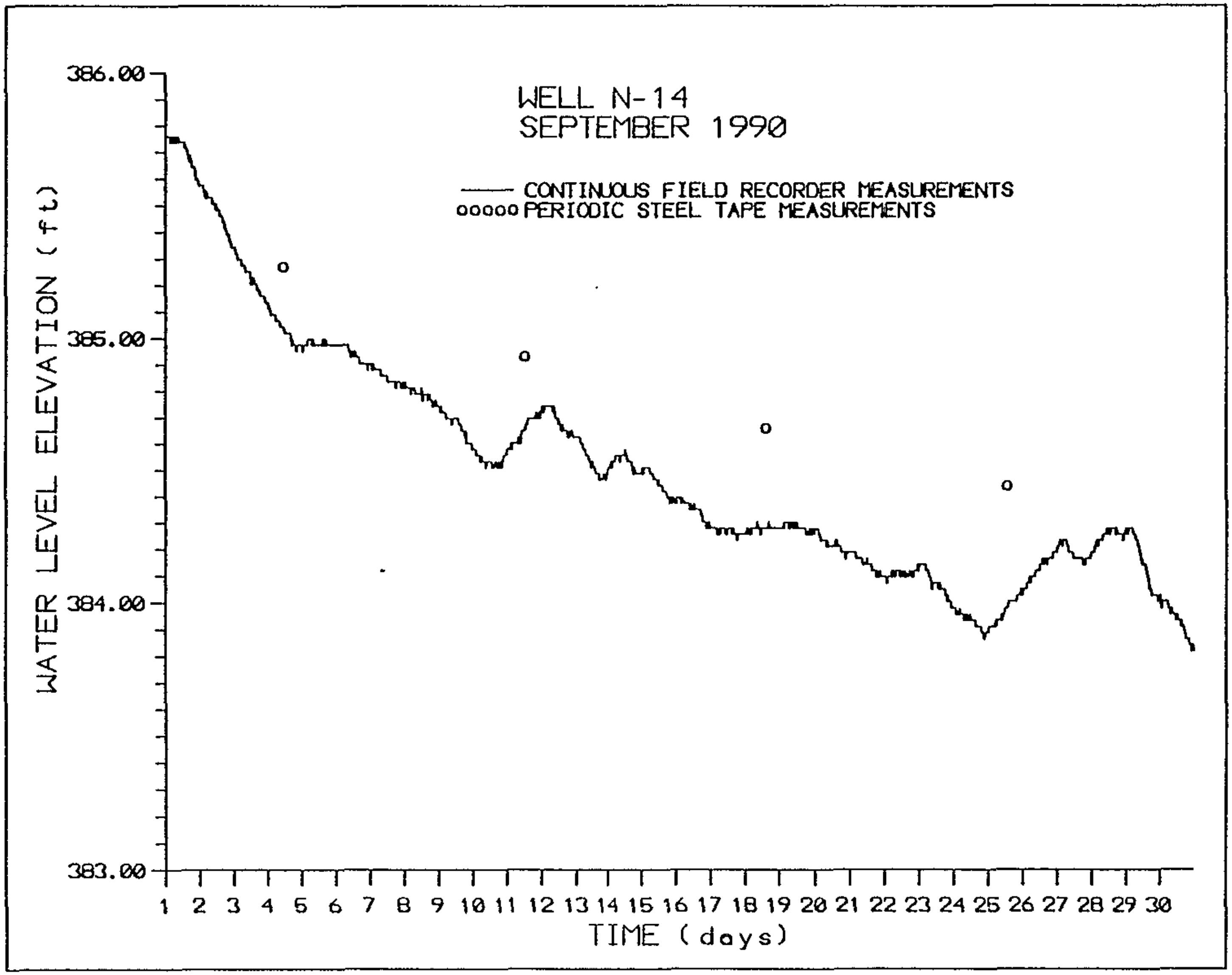

WELL N-14
MAY 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
389.00
388.00
387.00
386.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

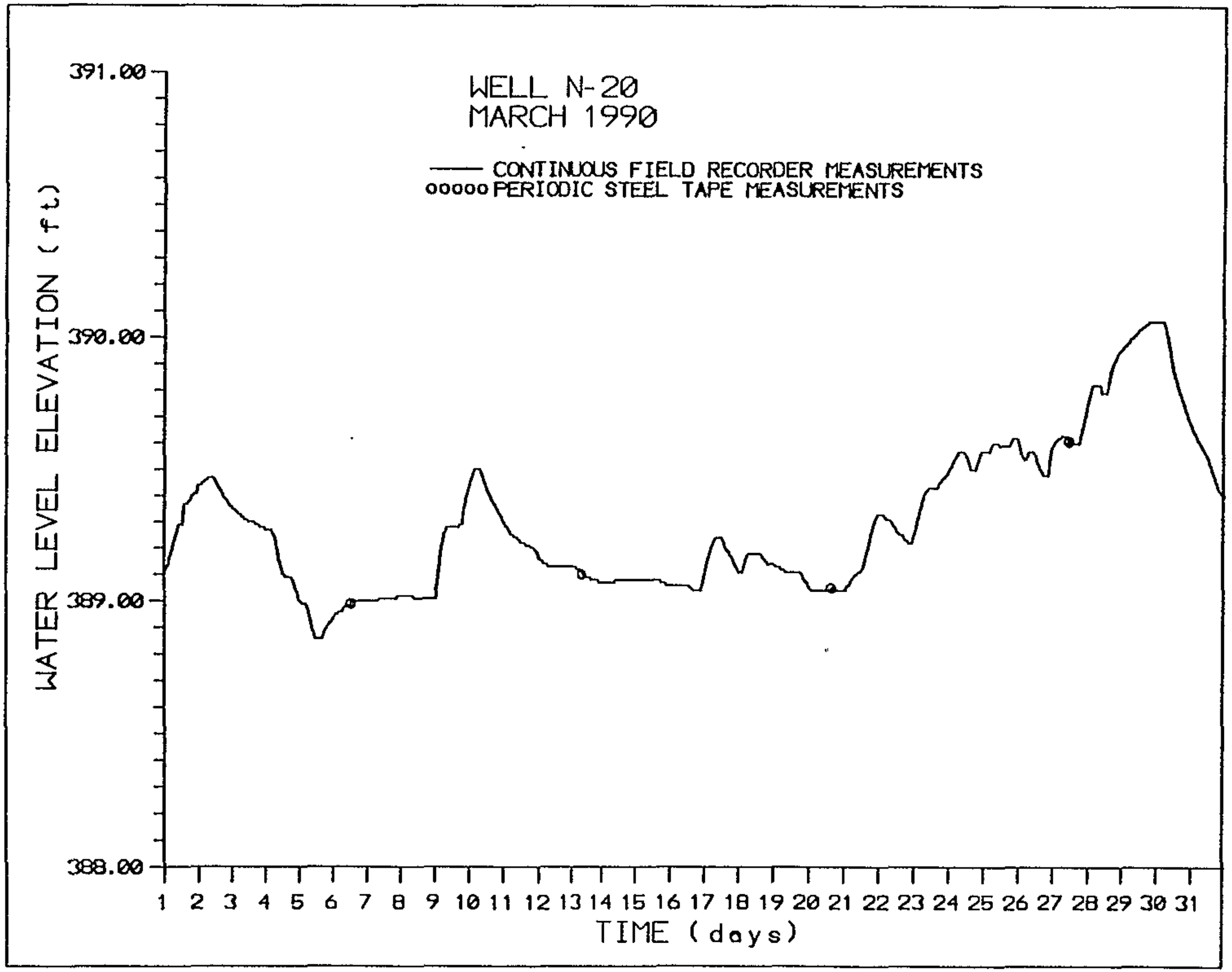

WELL N-14
JUNE 1990
ooooo CONTINUOUS FIELD RECORDER MEASUREMENTS
—— PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
391.00
389.00
387.00
385.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)


WELL N-14
JULY 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
390.00
389.00
388.00
387.00
386.00
385.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

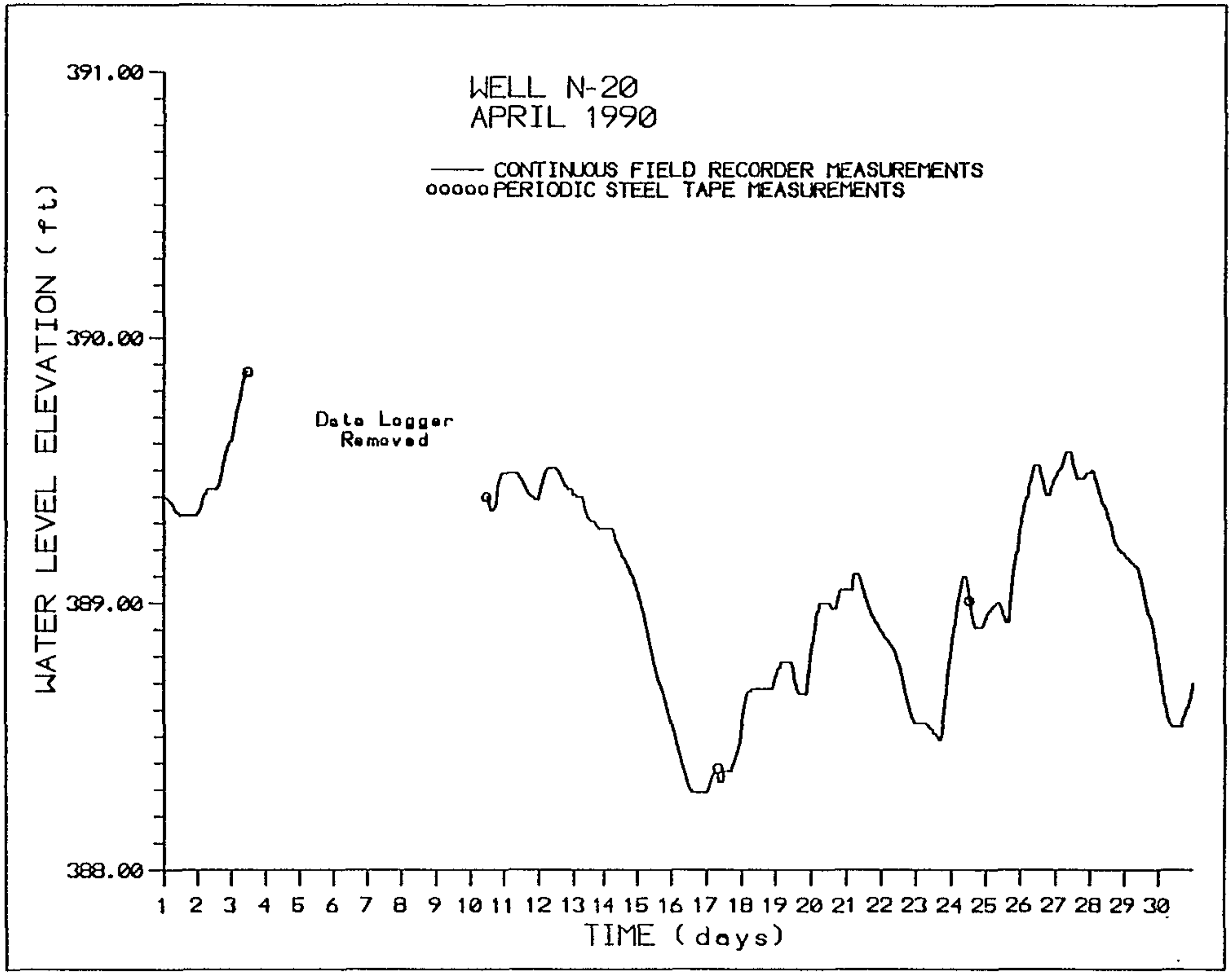


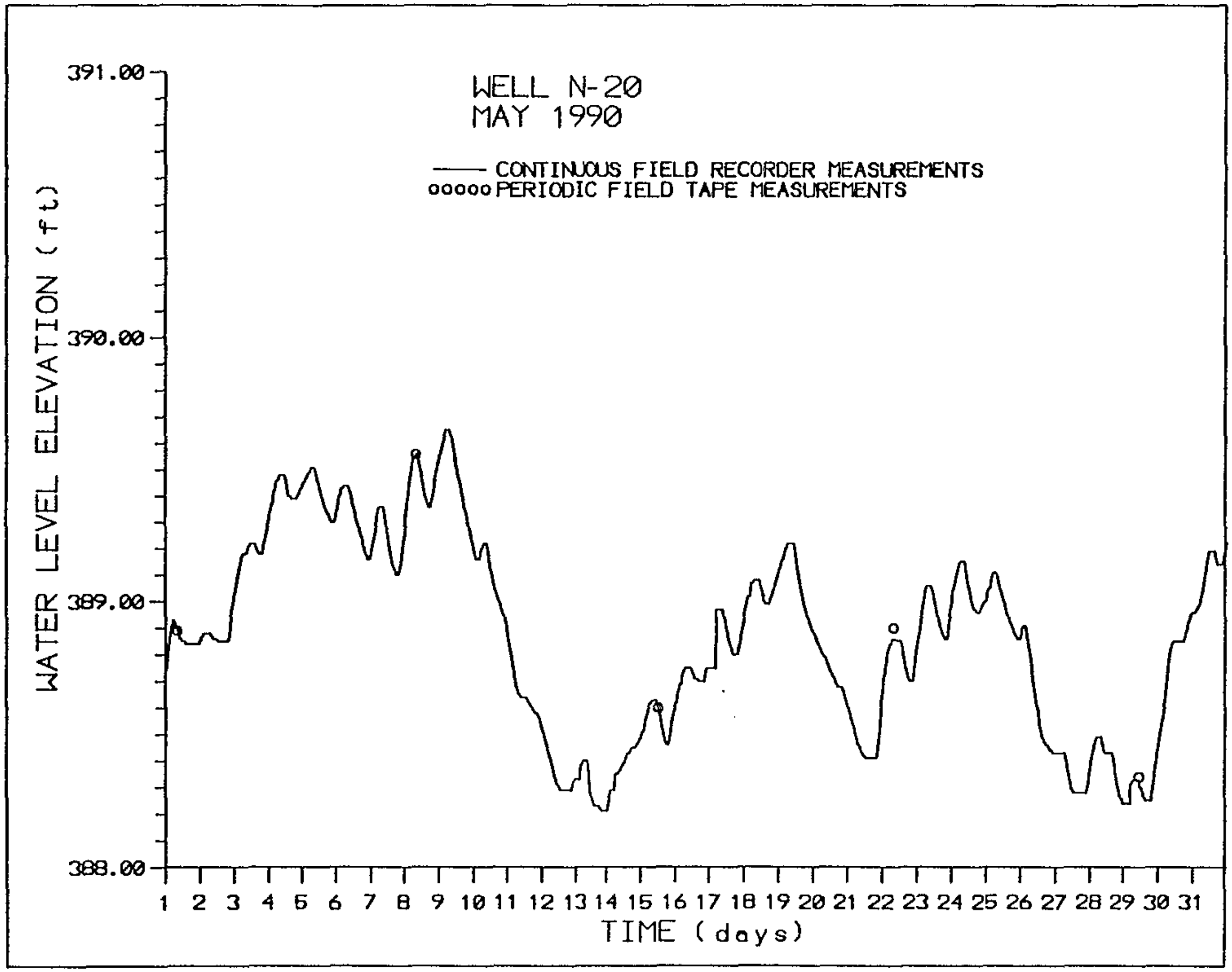
WELL N-14
AUGUST 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
388.00
387.00
386.00
385.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

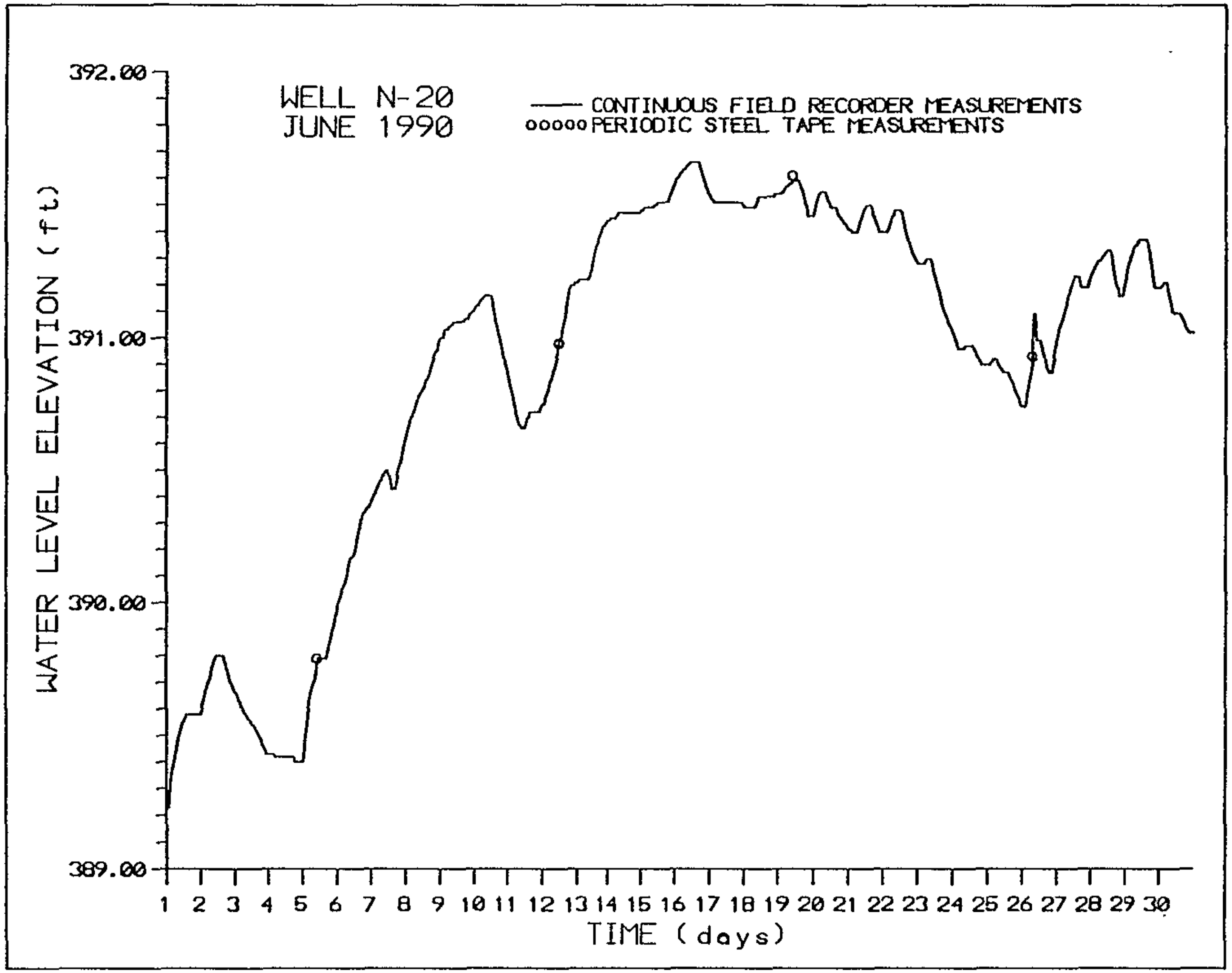

WELL N-14
SEPTEMBER 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
386.00
385.00
384.00
383.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)



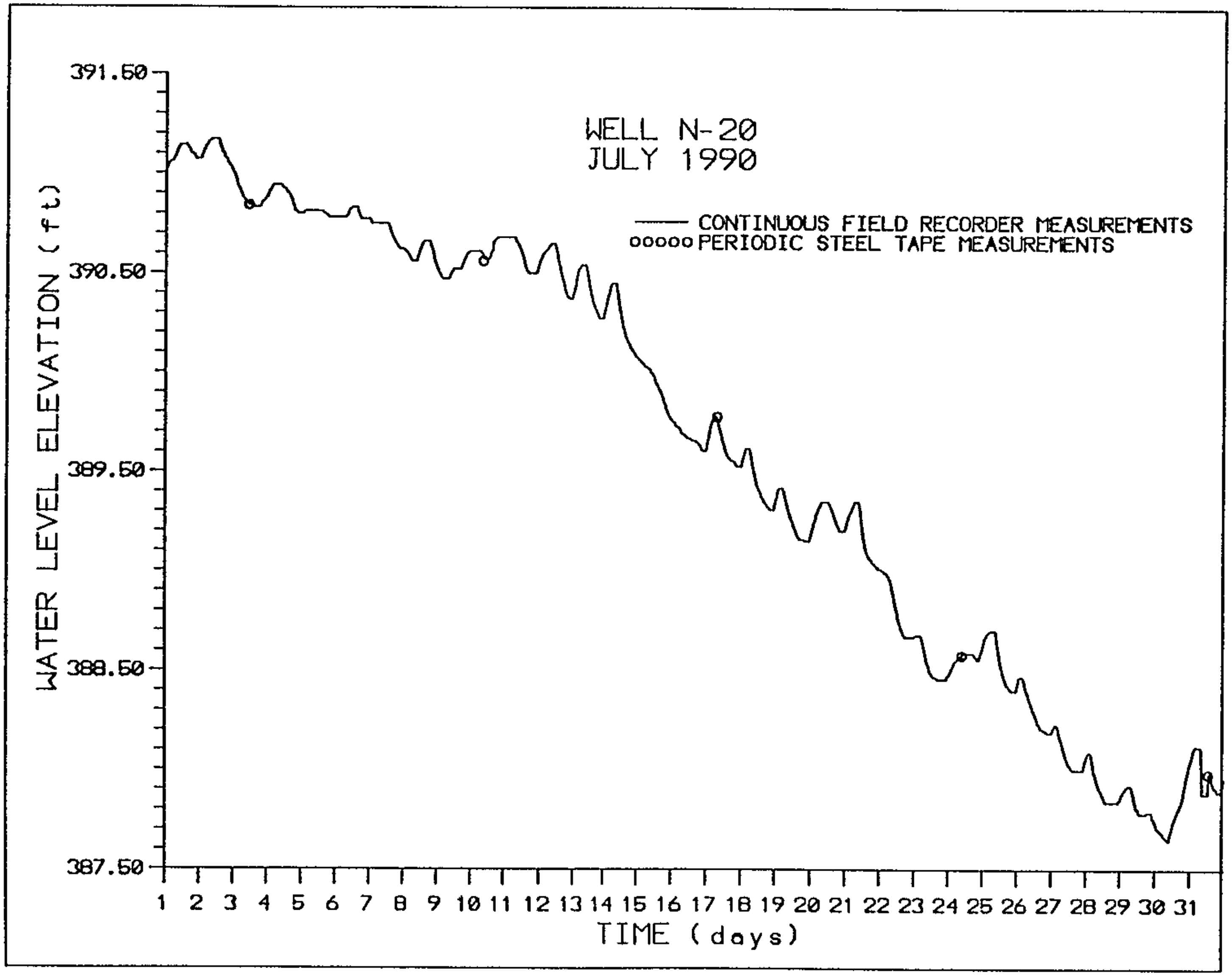
WELL N-20
MARCH 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
391.00
390.00
389.00
388.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)


WELL N-20
APRIL 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
Data Logger
Removed
WATER LEVEL ELEVATION (ft)
391.00
390.00
389.00
388.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)

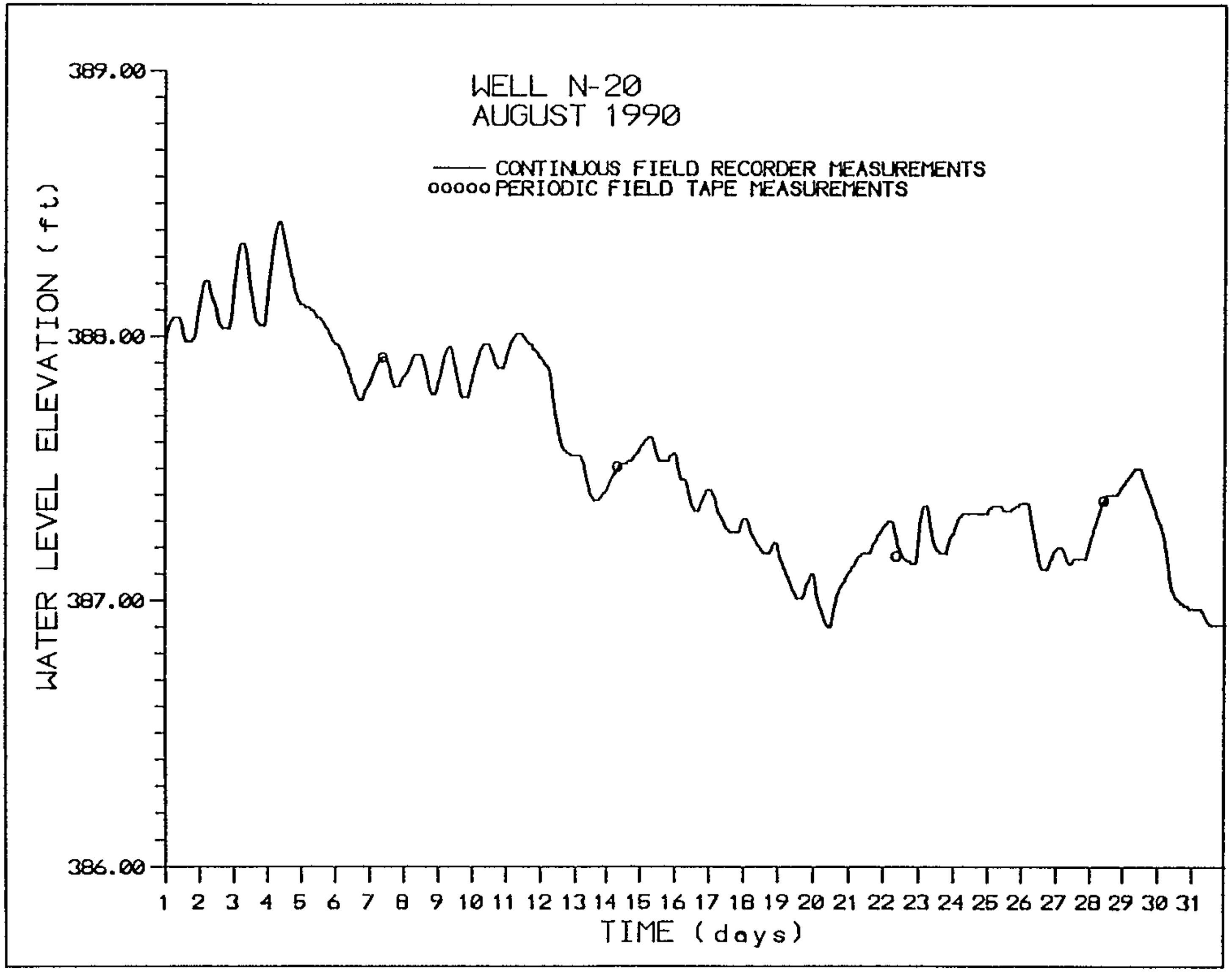

WELL N-20
MAY 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC FIELD TAPE MEASUREMENTS
391.00
390.00
389.00
388.00
WATER LEVEL ELEVATION (ft)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

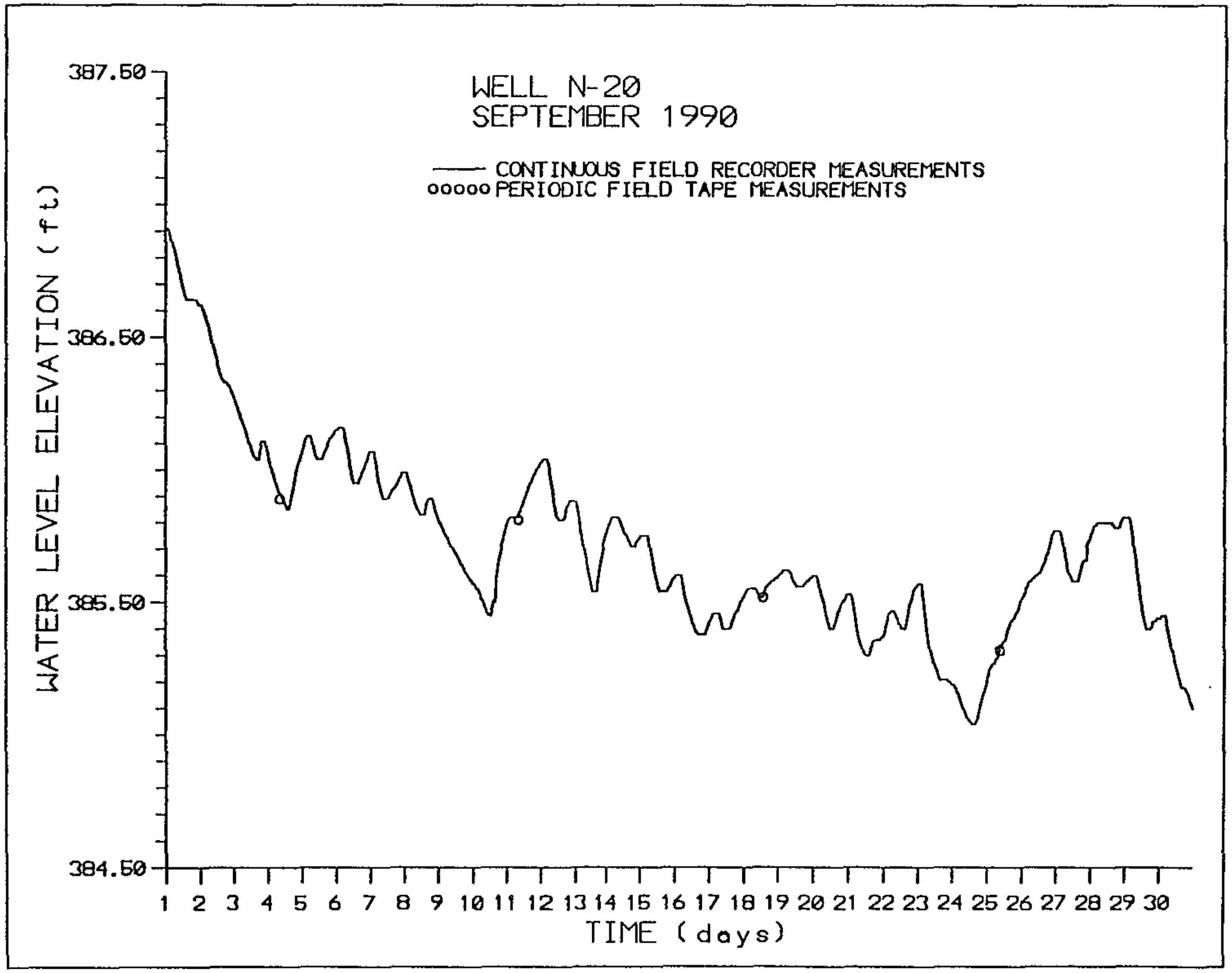

WELL N-20
JUNE 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
392.00
391.00
390.00
389.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)

9413282.0064

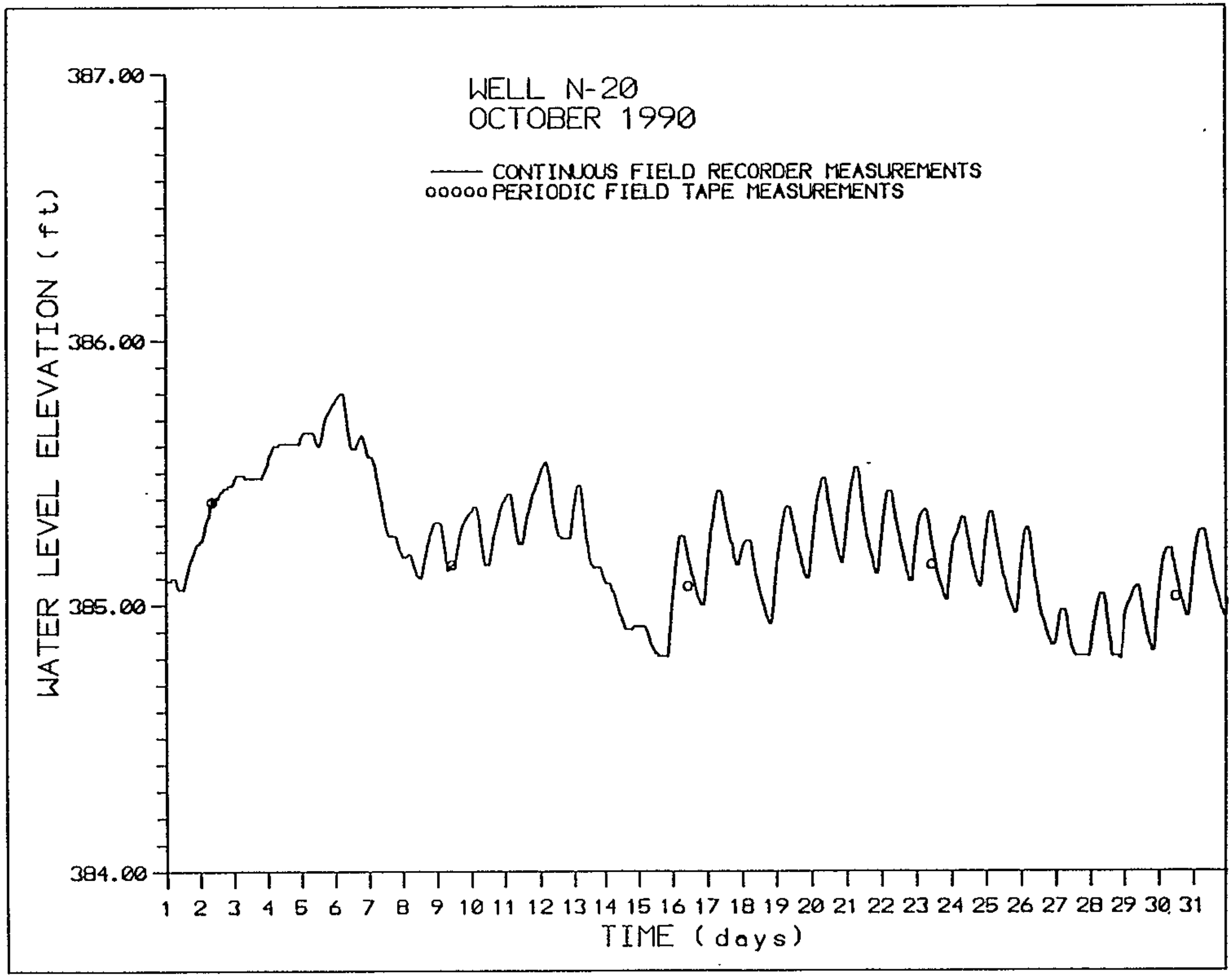


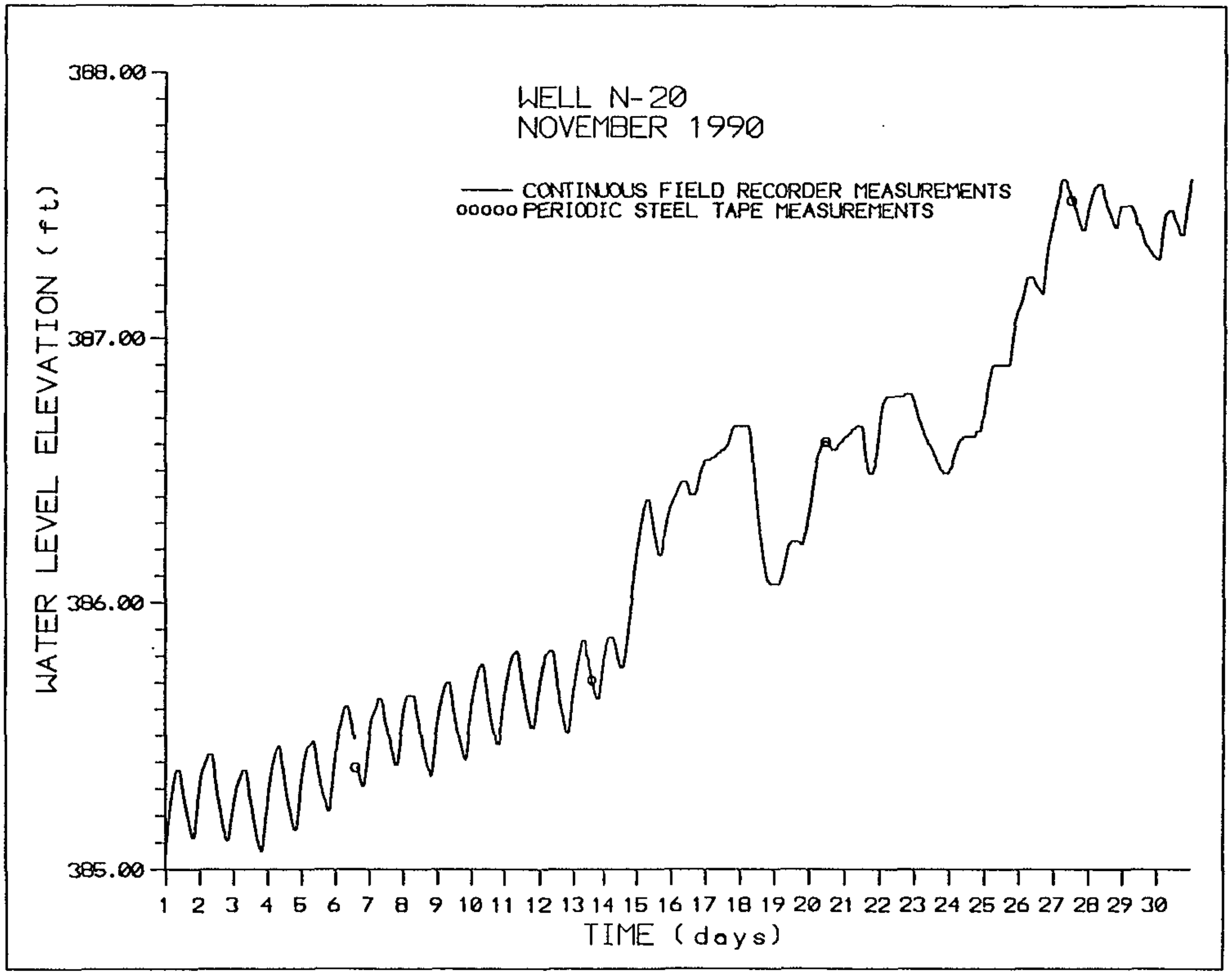
9413262.0065

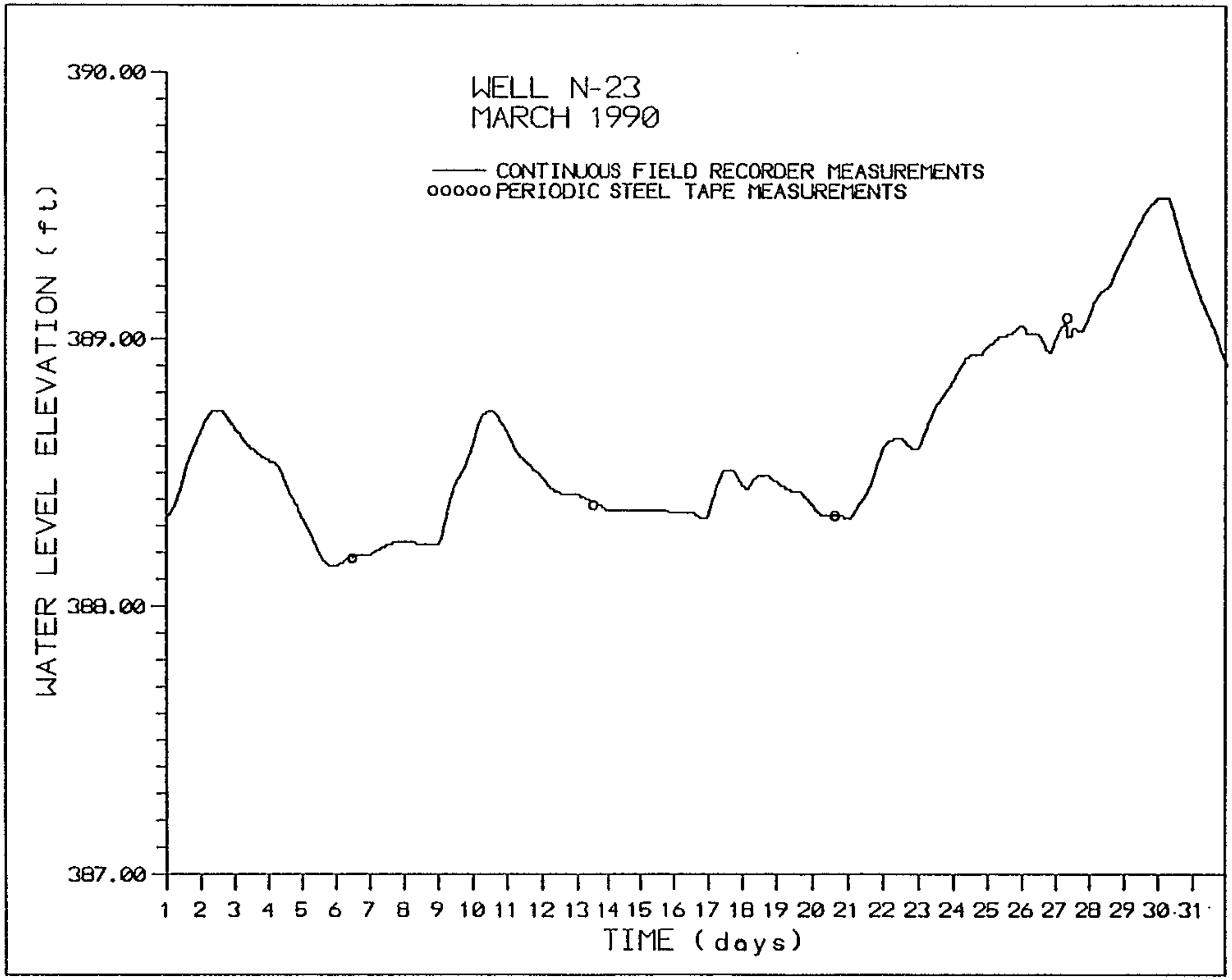




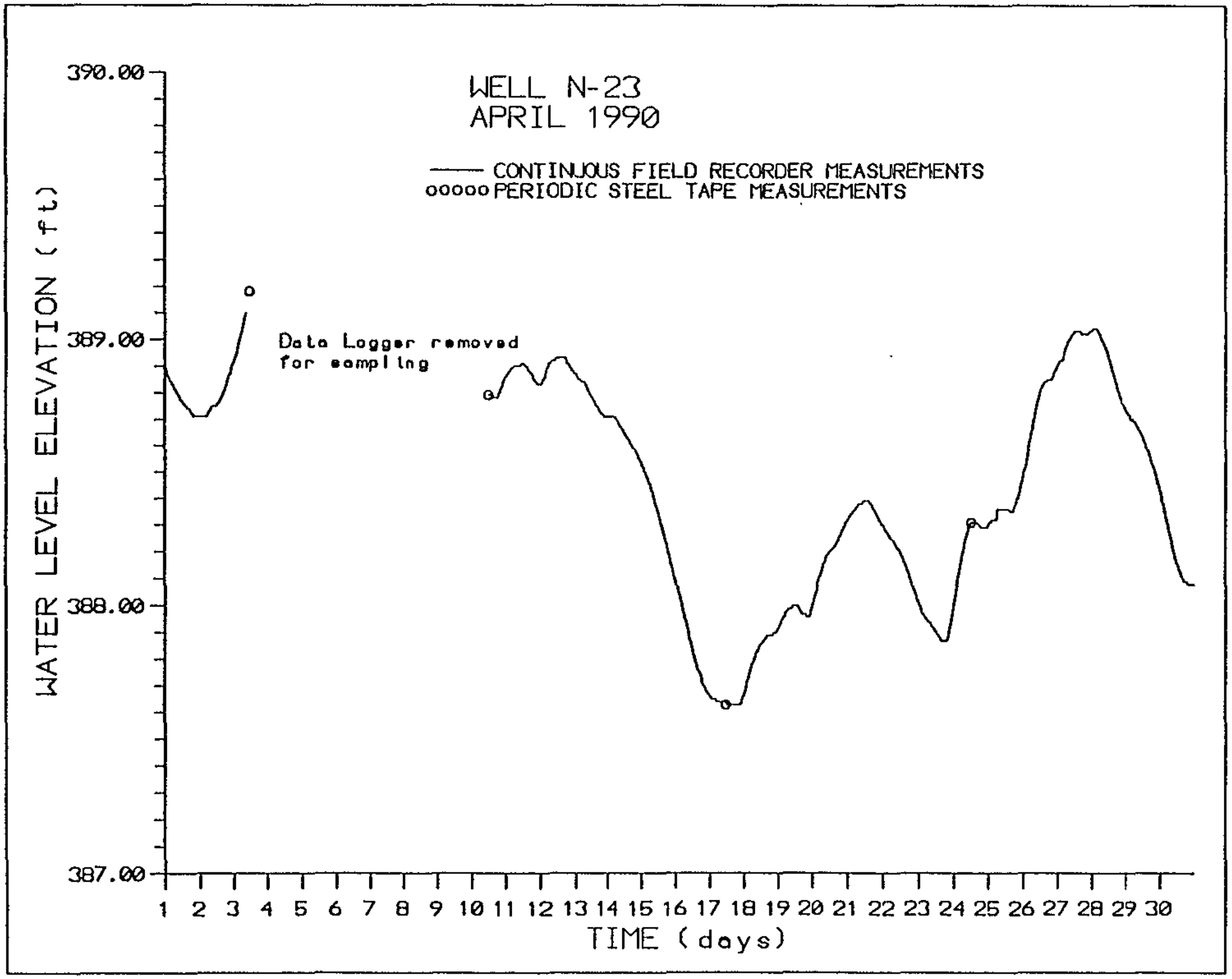
WELL N-20
SEPTEMBER 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC FIELD TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
387.50
386.50
385.50
384.50
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)

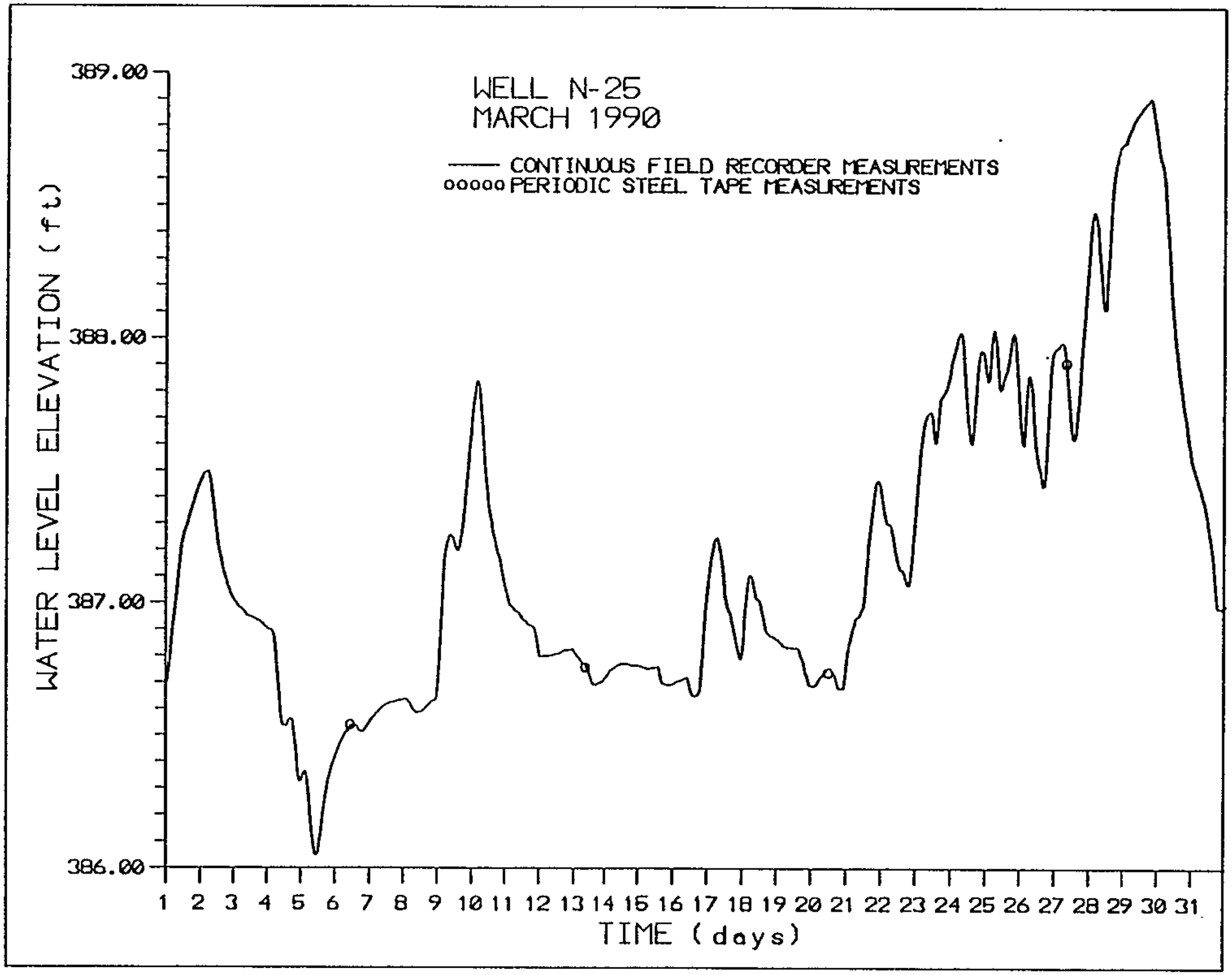

WELL N-20
OCTOBER 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC FIELD TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
387.00
386.00
385.00
384.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

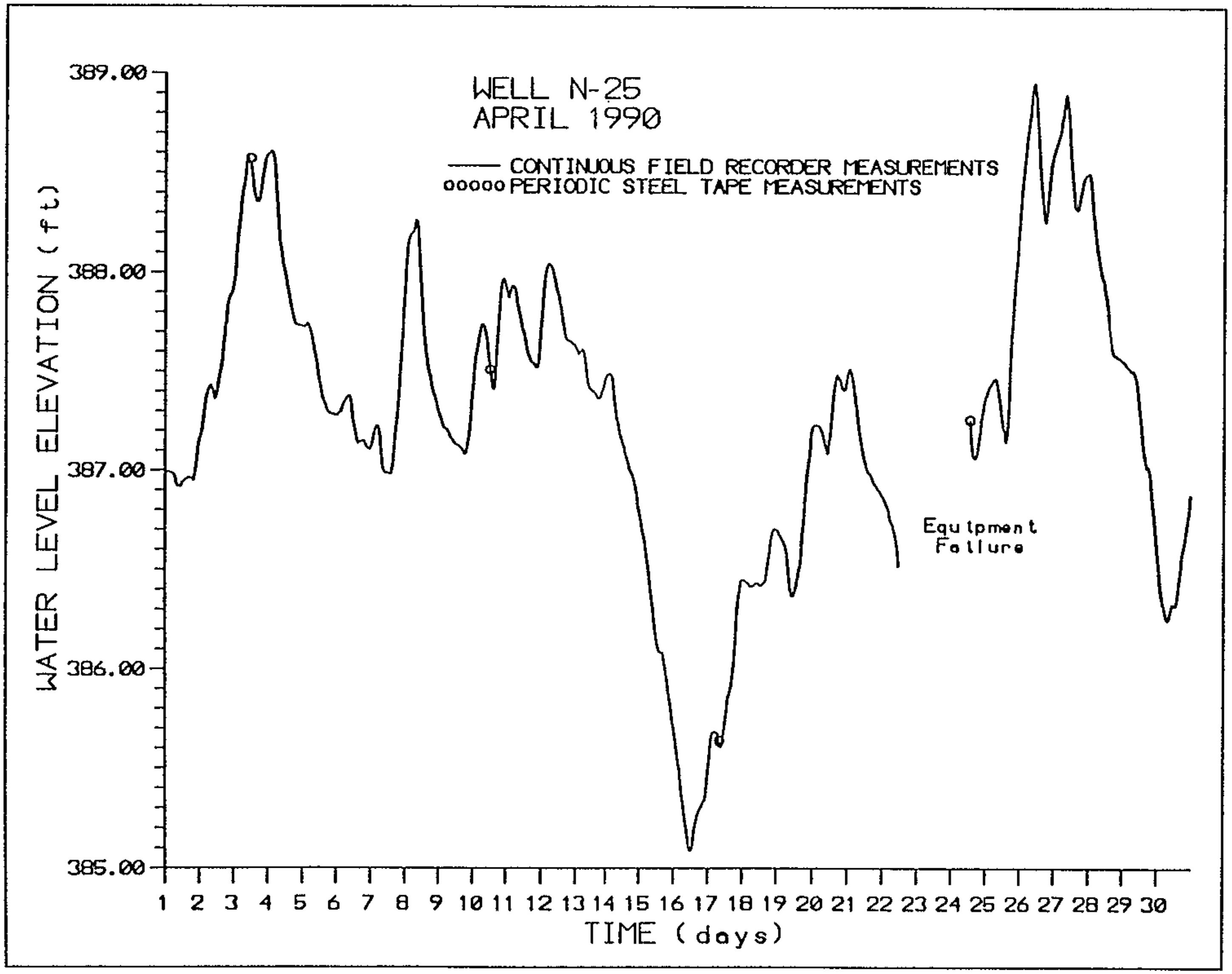

WELL N-20
NOVEMBER 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
388.00
387.00
386.00
385.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)

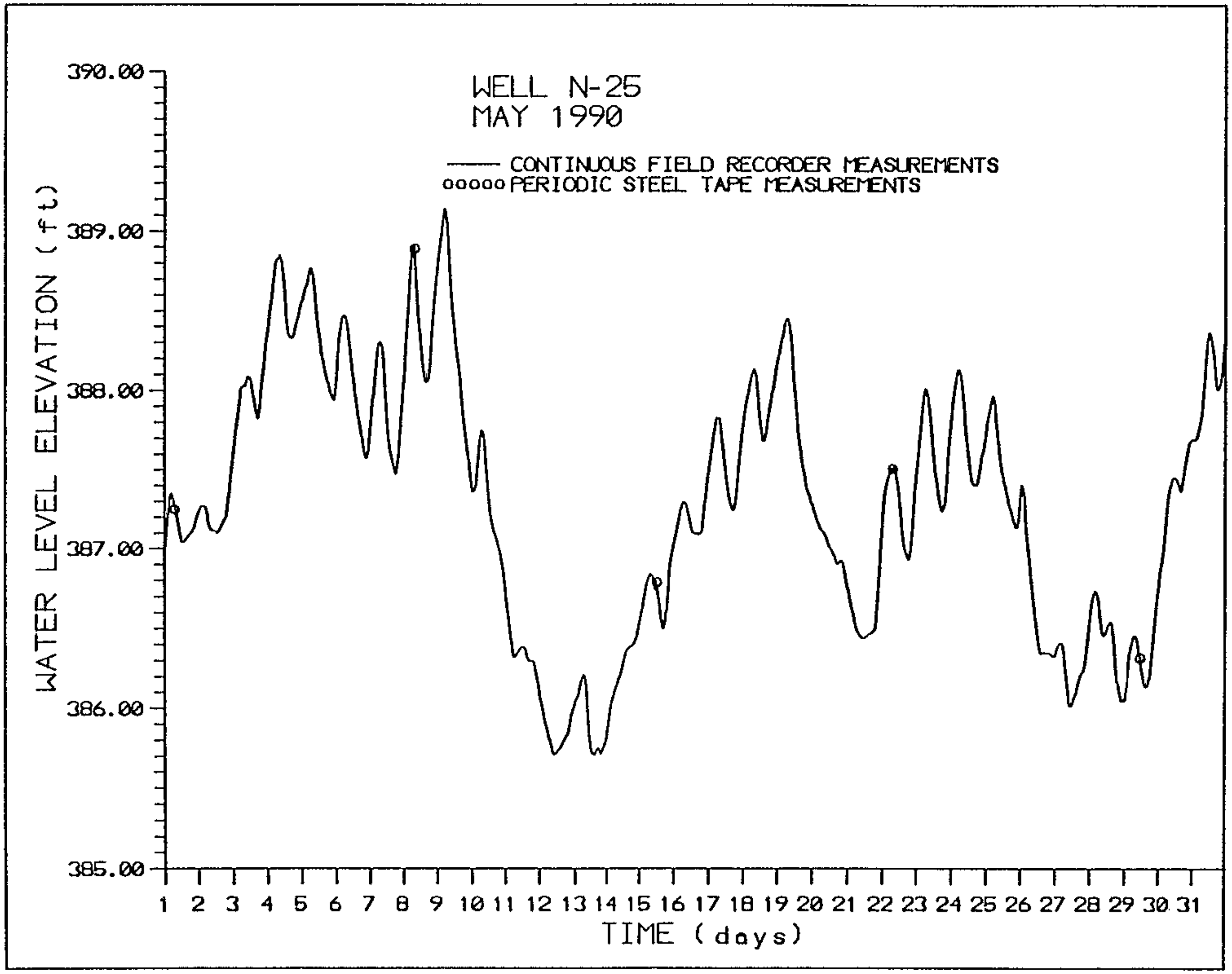

WELL N-23
MARCH 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
390.00
389.00
388.00
387.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

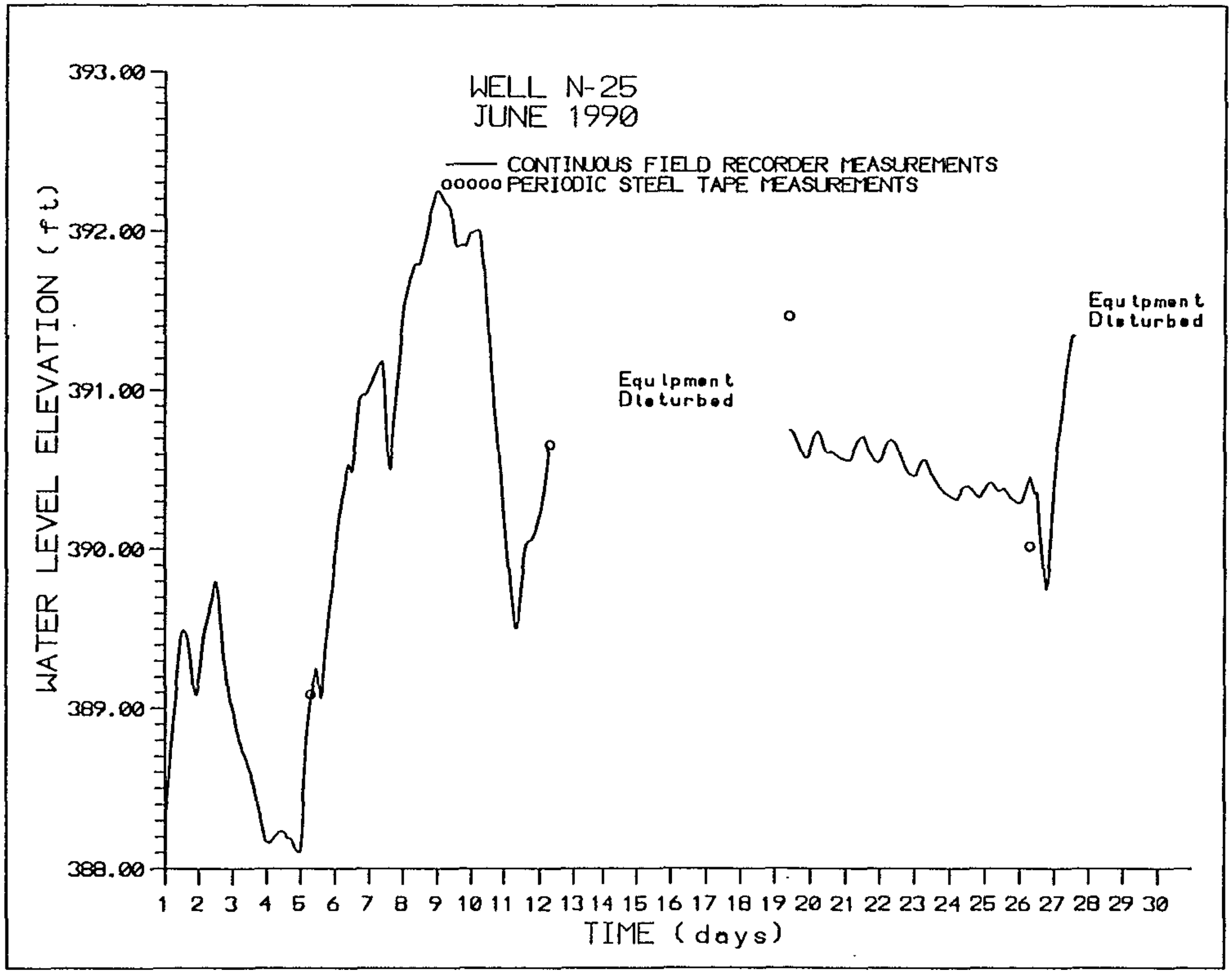
9413282.0070

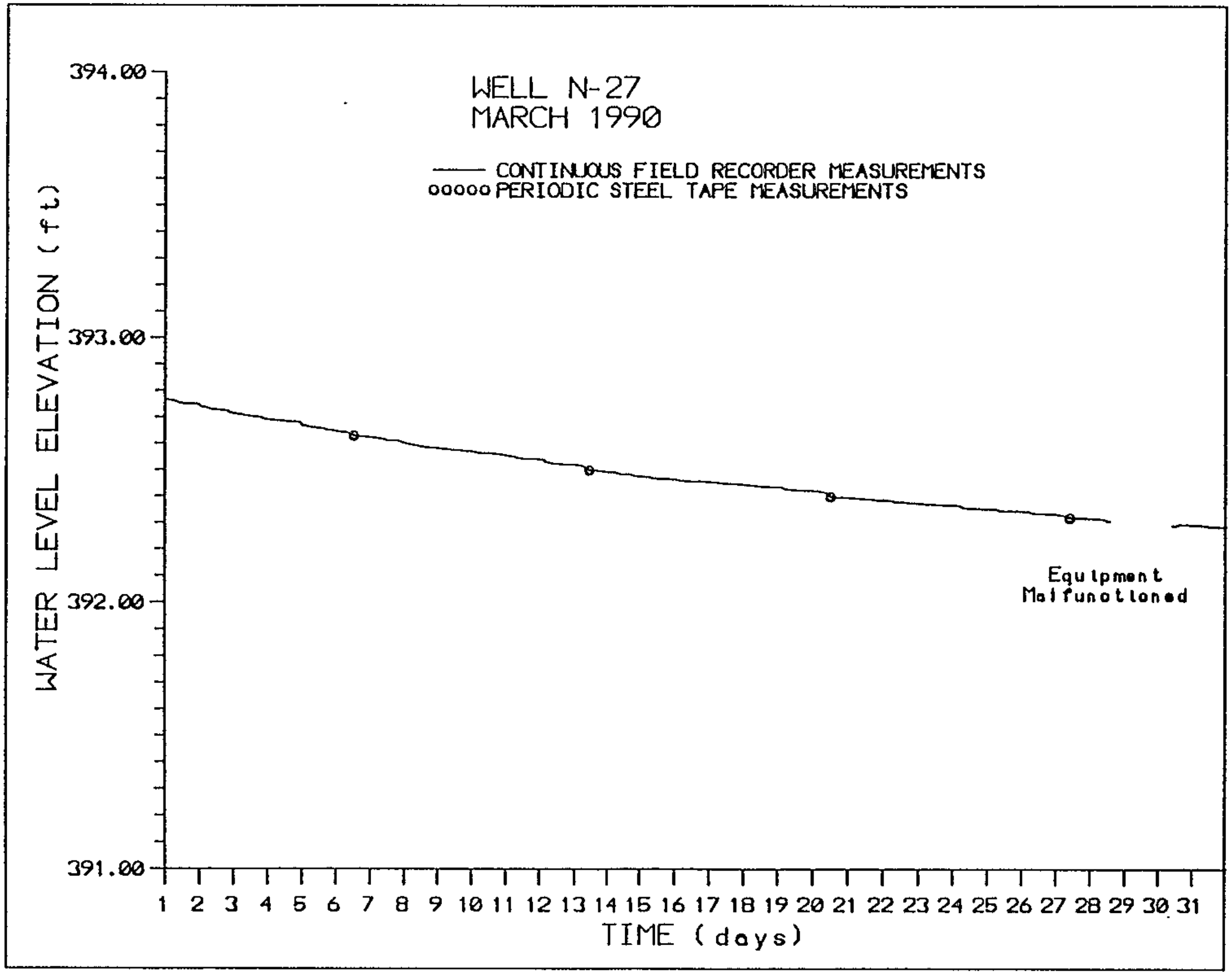


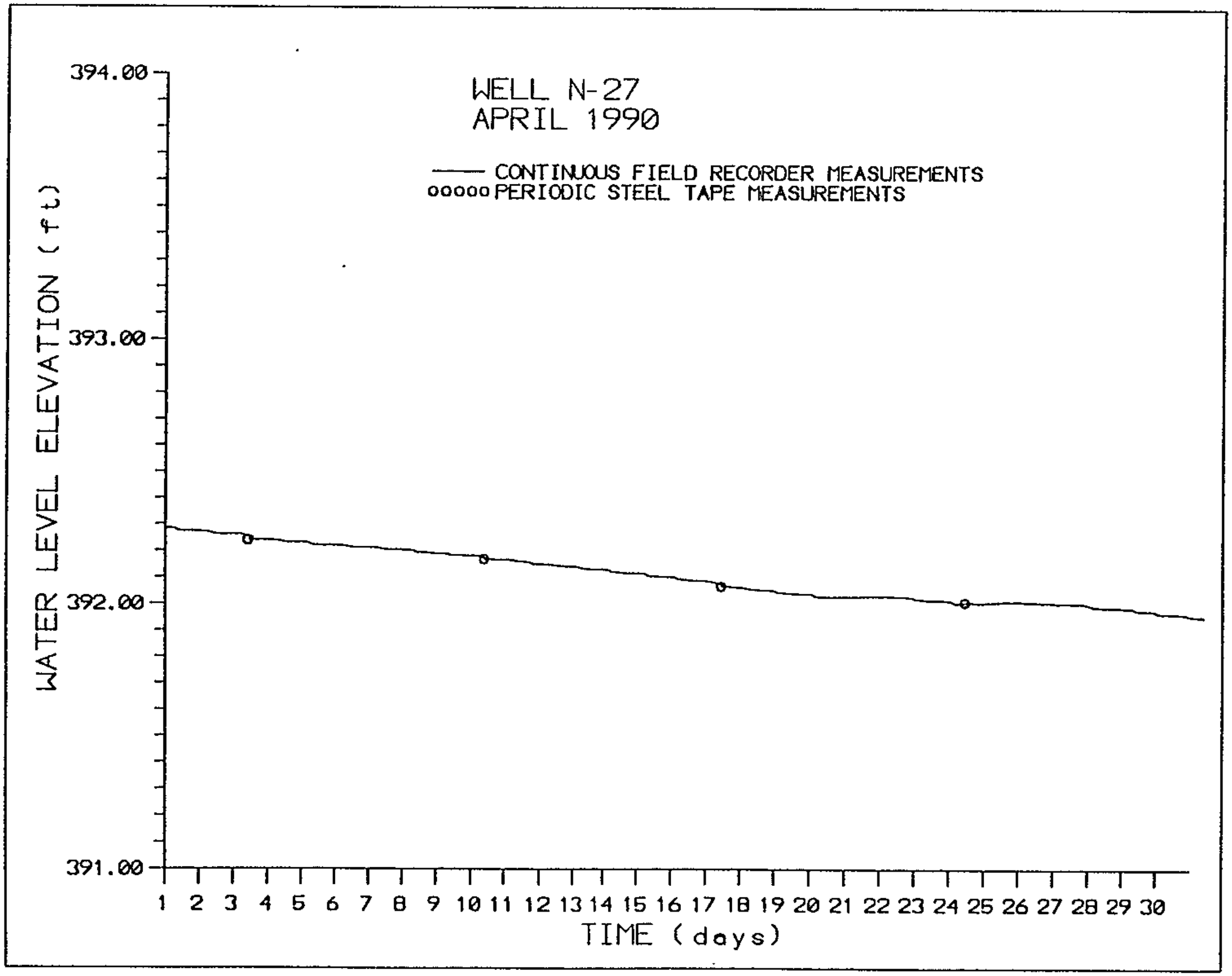

WELL N-25
MARCH 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
389.00
388.00
387.00
386.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

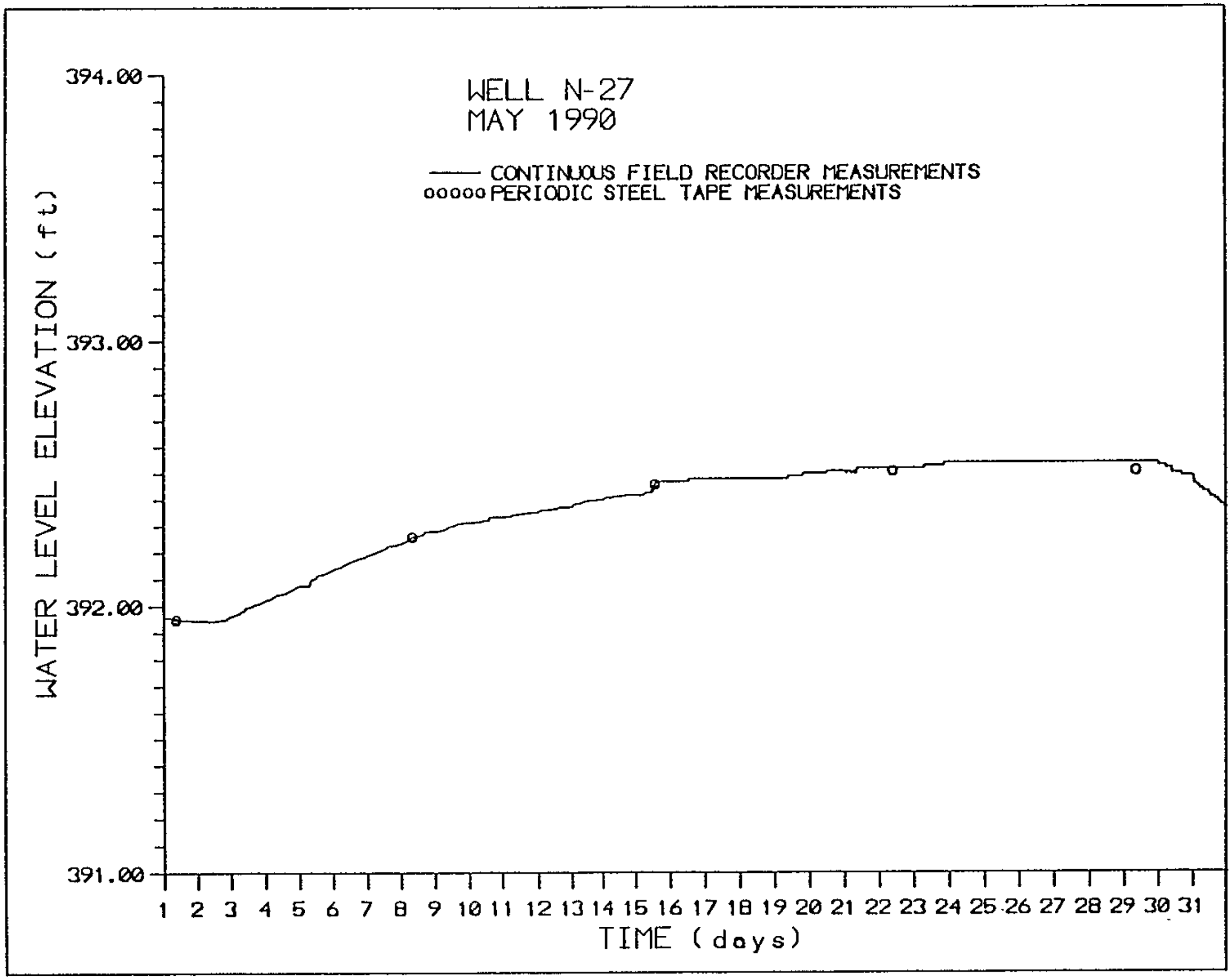

WELL N-25
APRIL 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
389.00
388.00
387.00
386.00
385.00
Equipment Failure
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)

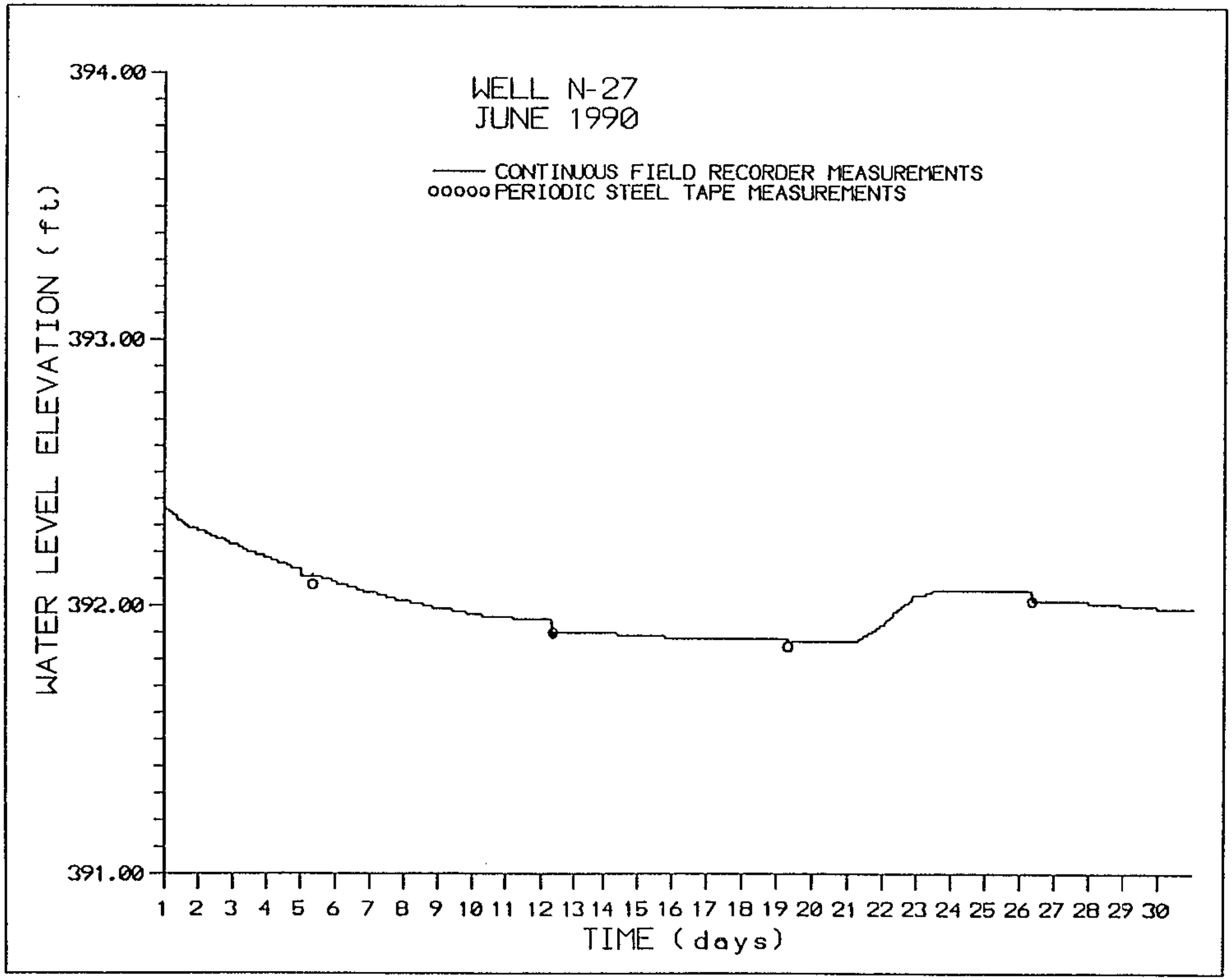

WELL N-25
MAY 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
390.00
389.00
388.00
387.00
386.00
385.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

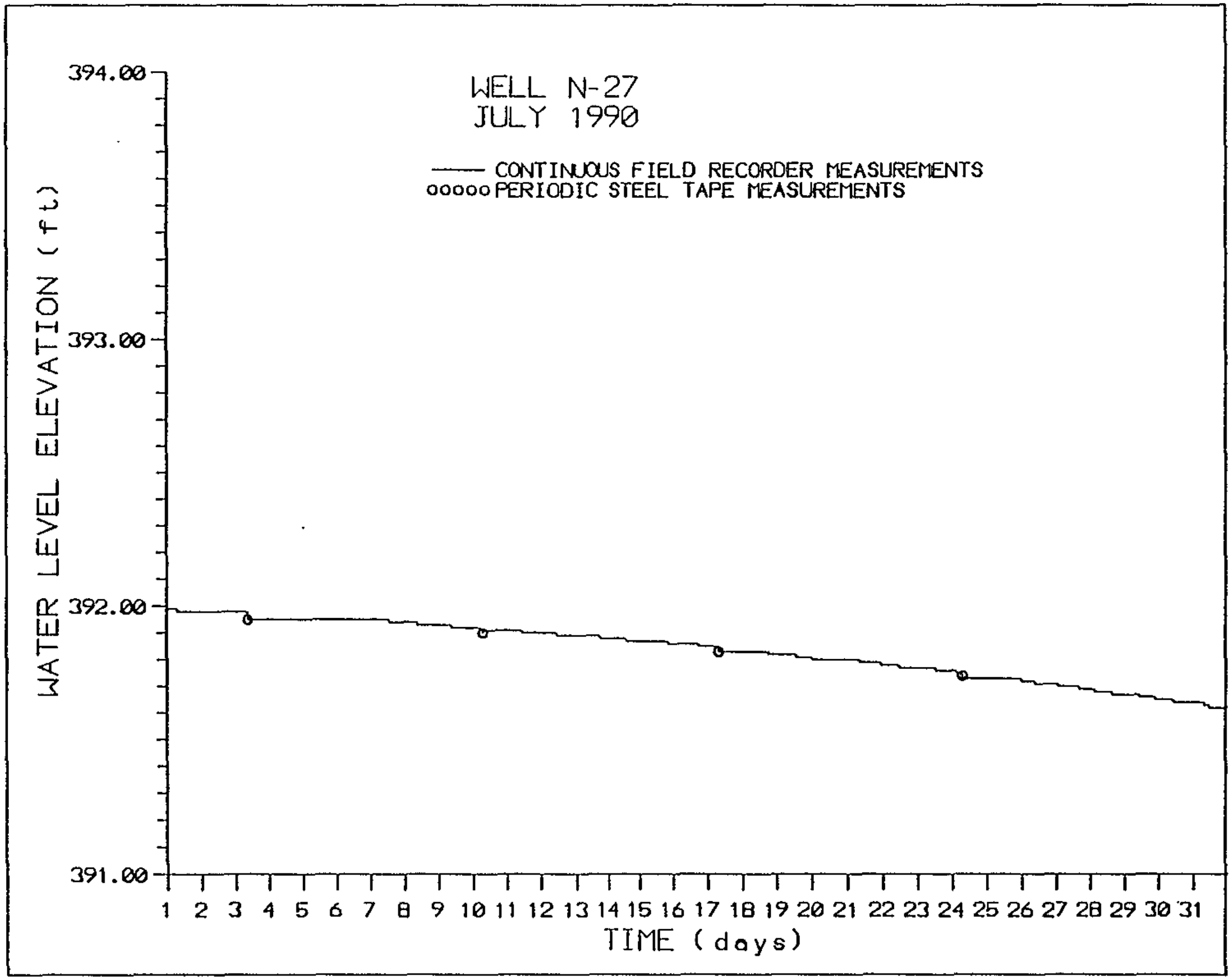

WELL N-25
JUNE 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
Equipment Disturbed
Equipment Disturbed
WATER LEVEL ELEVATION (ft)
393.00
392.00
391.00
390.00
389.00
388.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)

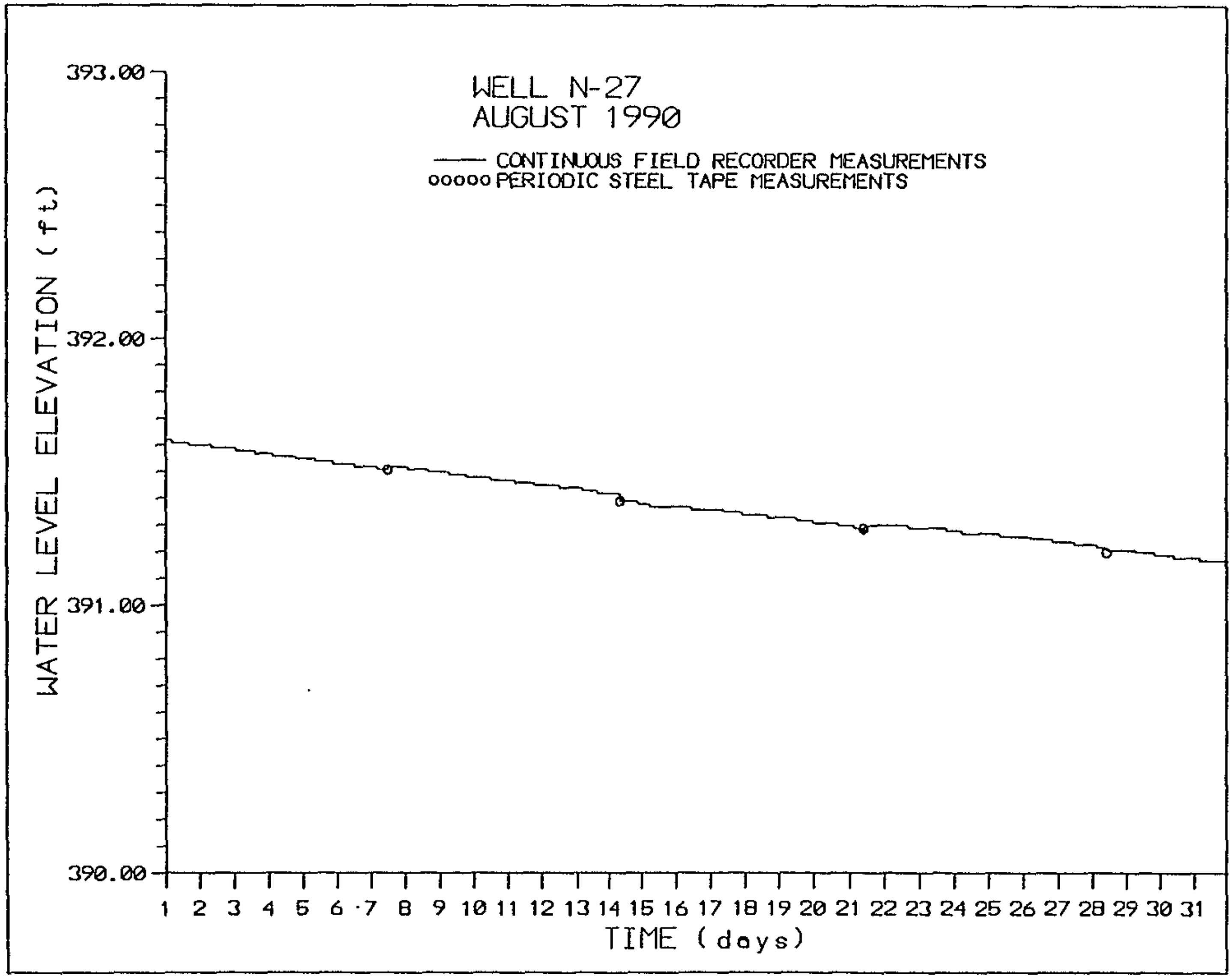

WELL N-27
MARCH 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
394.00
393.00
392.00
391.00
Equipment Malfunctioned
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

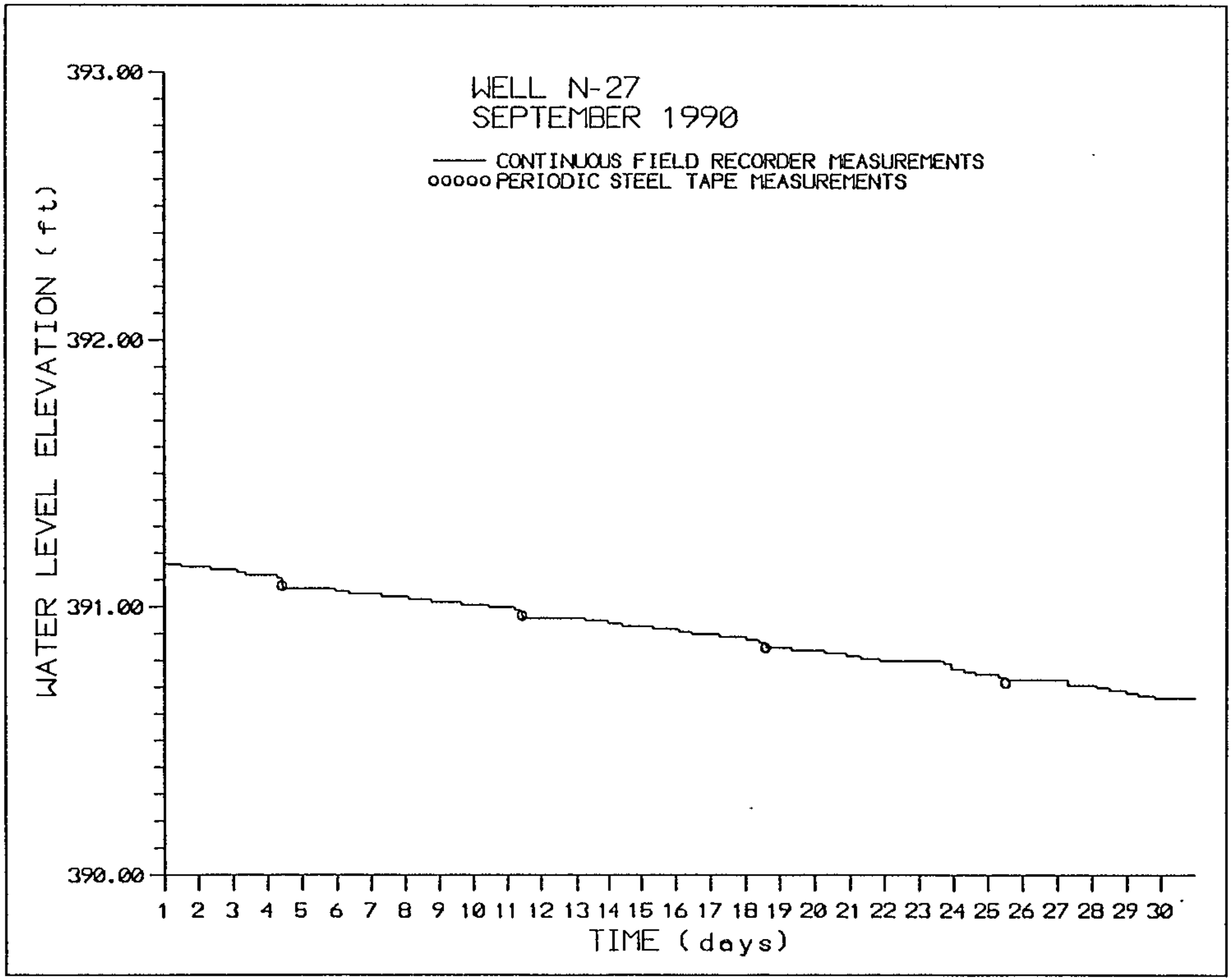

WELL N-27
APRIL 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
394.00
393.00
392.00
391.00
WATER LEVEL ELEVATION (ft)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)

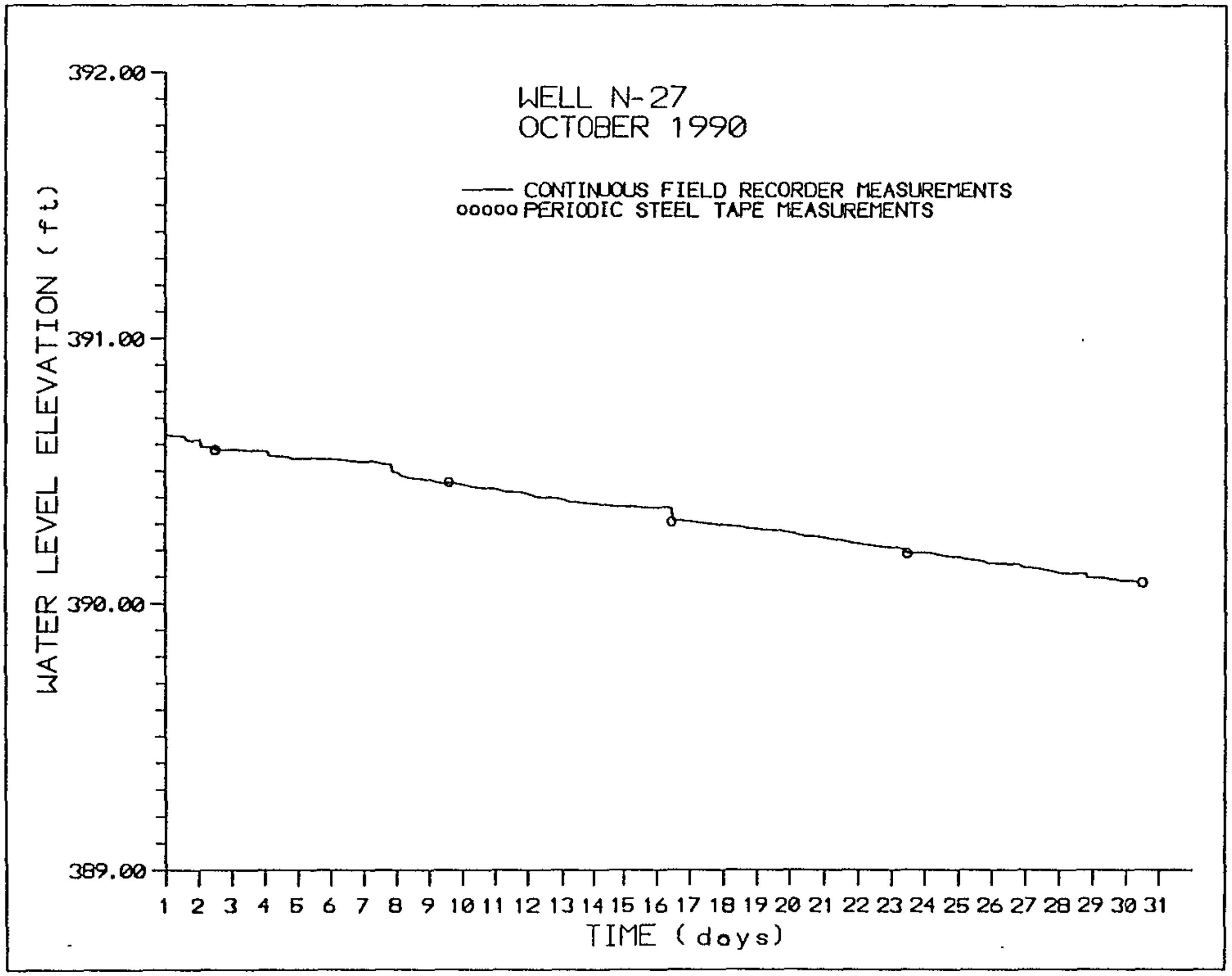

WELL N-27
MAY 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
394.00
393.00
392.00
391.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

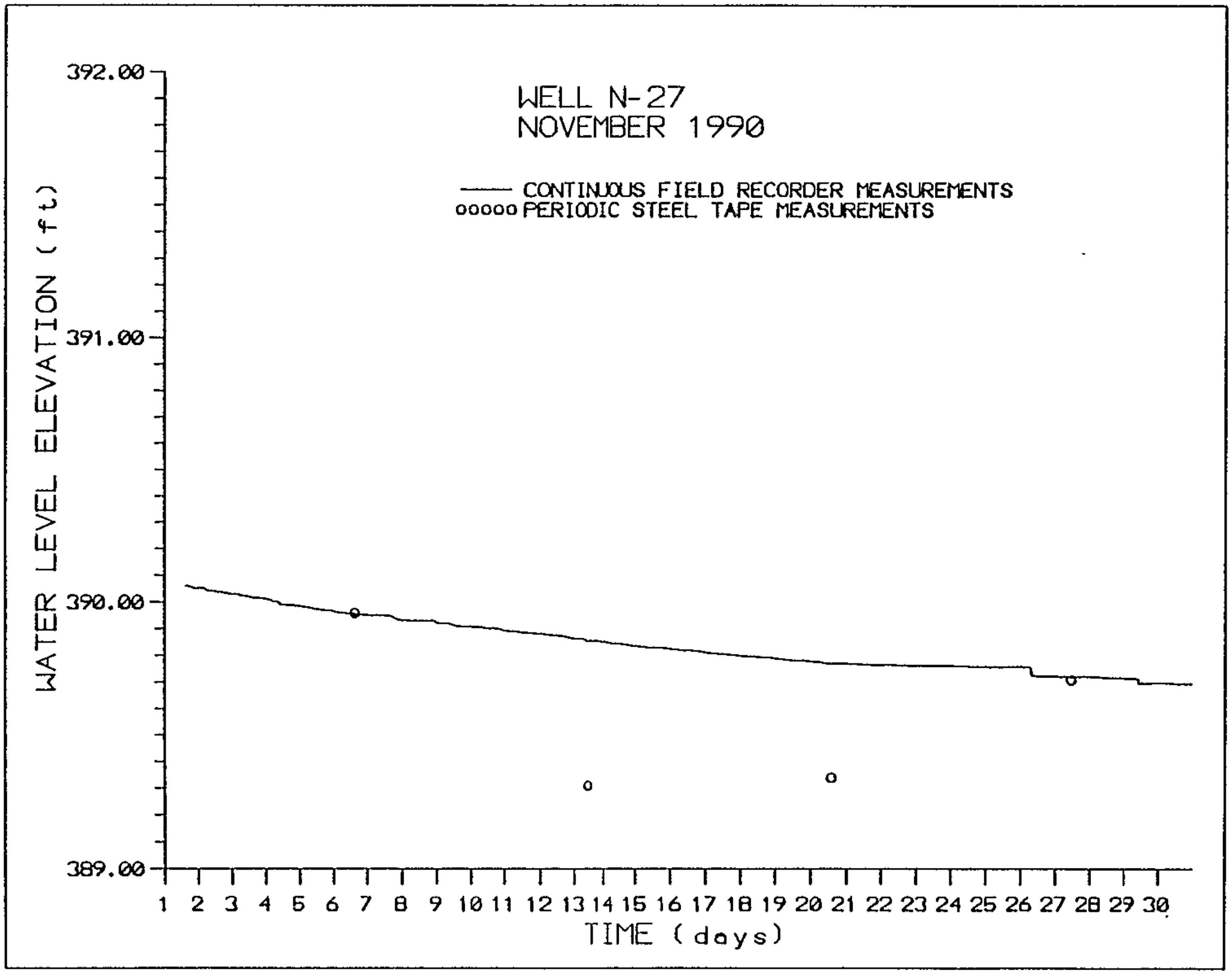

WELL N-27
JUNE 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
394.00
393.00
392.00
391.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)

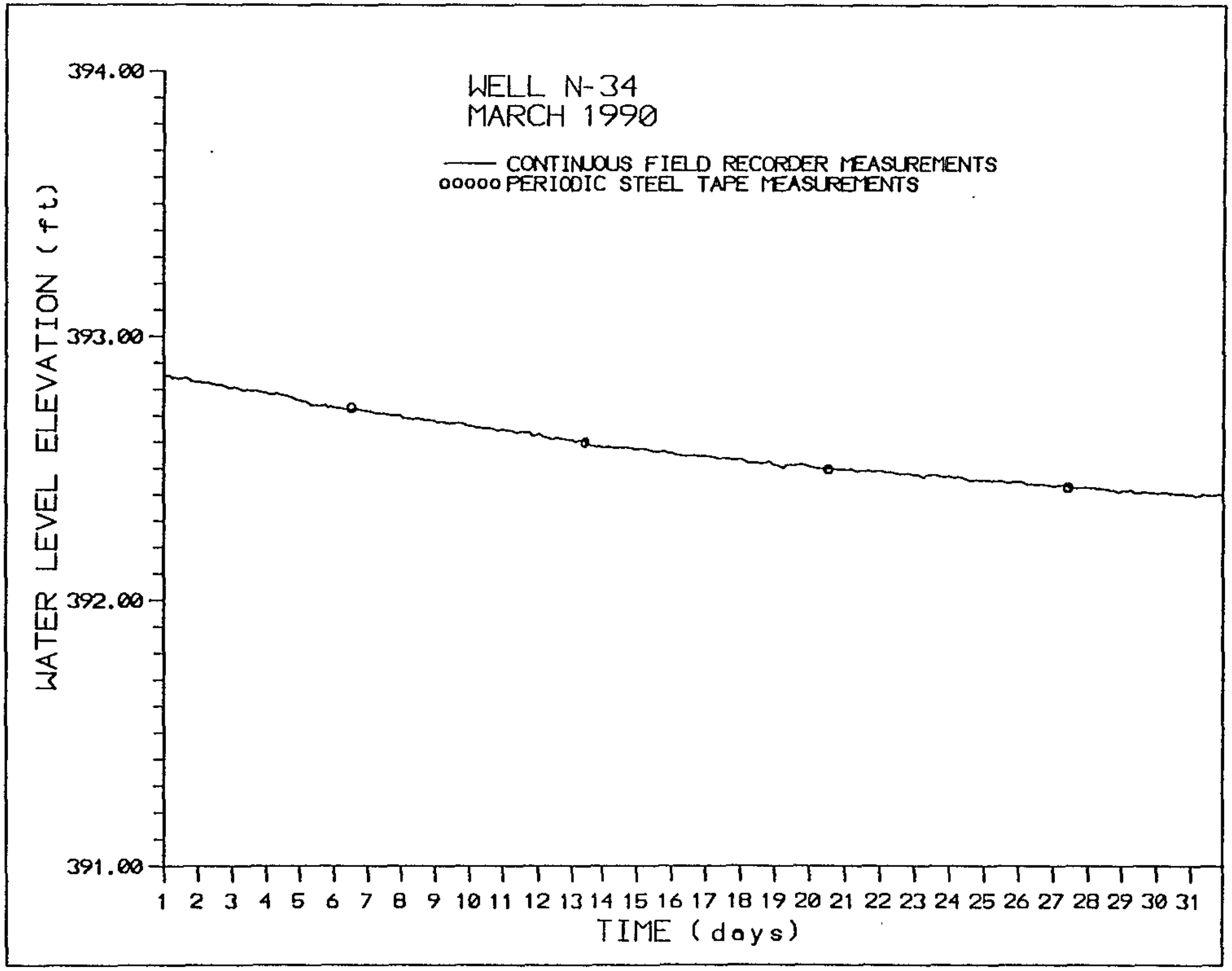

WELL N-27
JULY 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
394.00
393.00
392.00
391.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

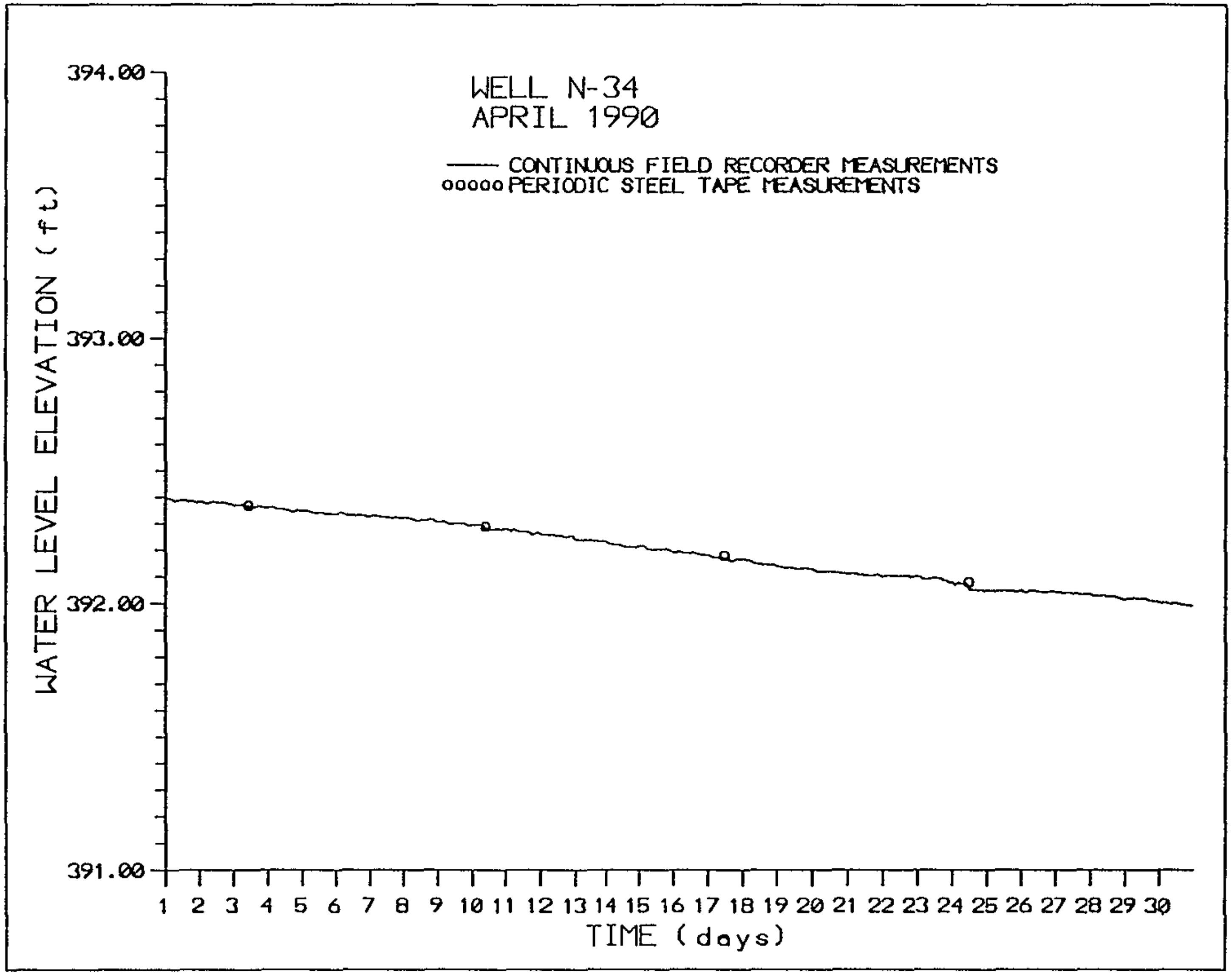

WELL N-27
AUGUST 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
393.00
392.00
391.00
390.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)


WELL N-27
SEPTEMBER 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
393.00
392.00
391.00
390.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)

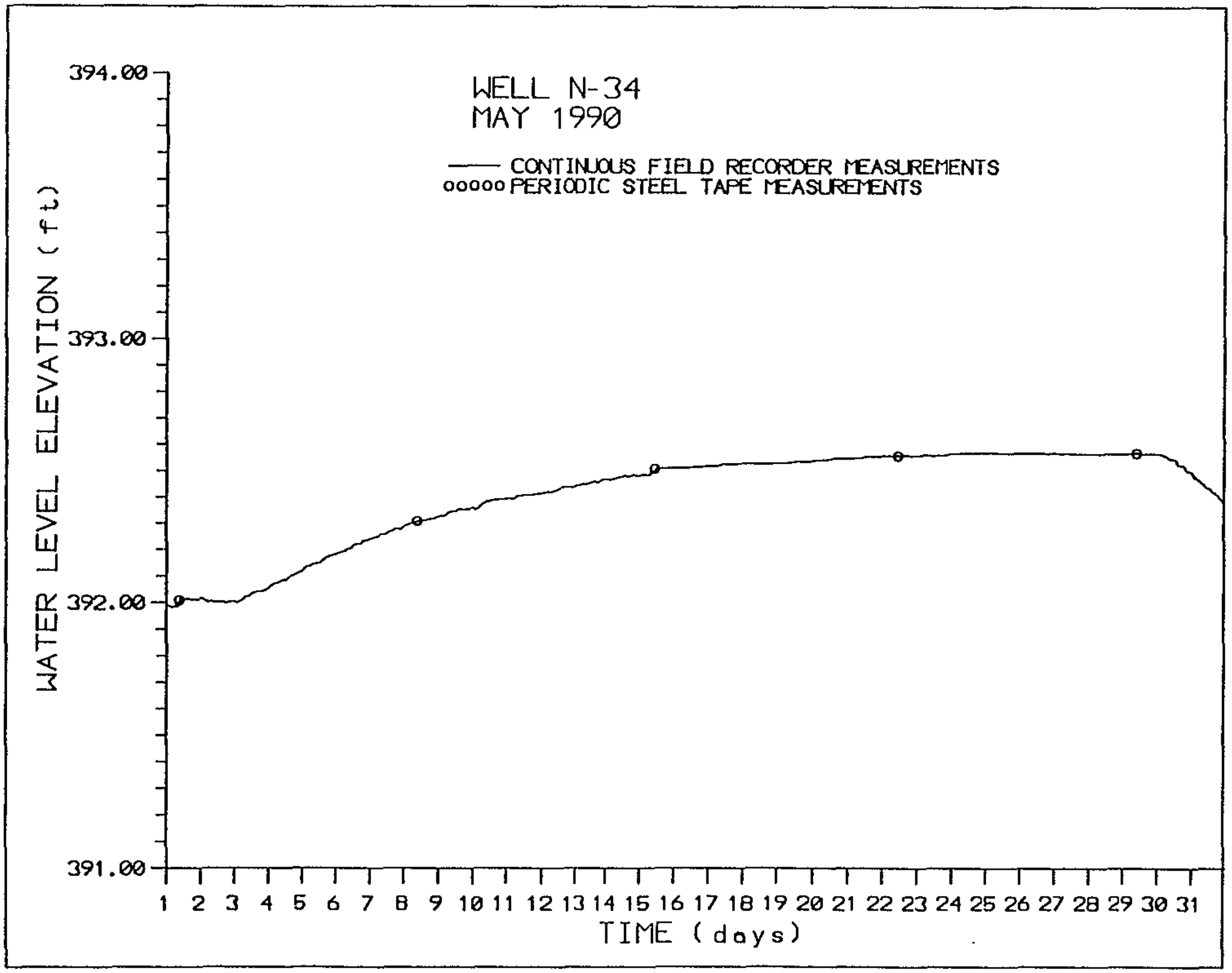

WELL N-27
OCTOBER 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
392.00
391.00
390.00
389.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)


WELL N-27
NOVEMBER 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
392.00
391.00
390.00
389.00
WATER LEVEL ELEVATION (ft)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)


WELL N-34
MARCH 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
394.00
393.00
392.00
391.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)


WELL N-34
APRIL 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
394.00
393.00
392.00
391.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)

9413282.0086



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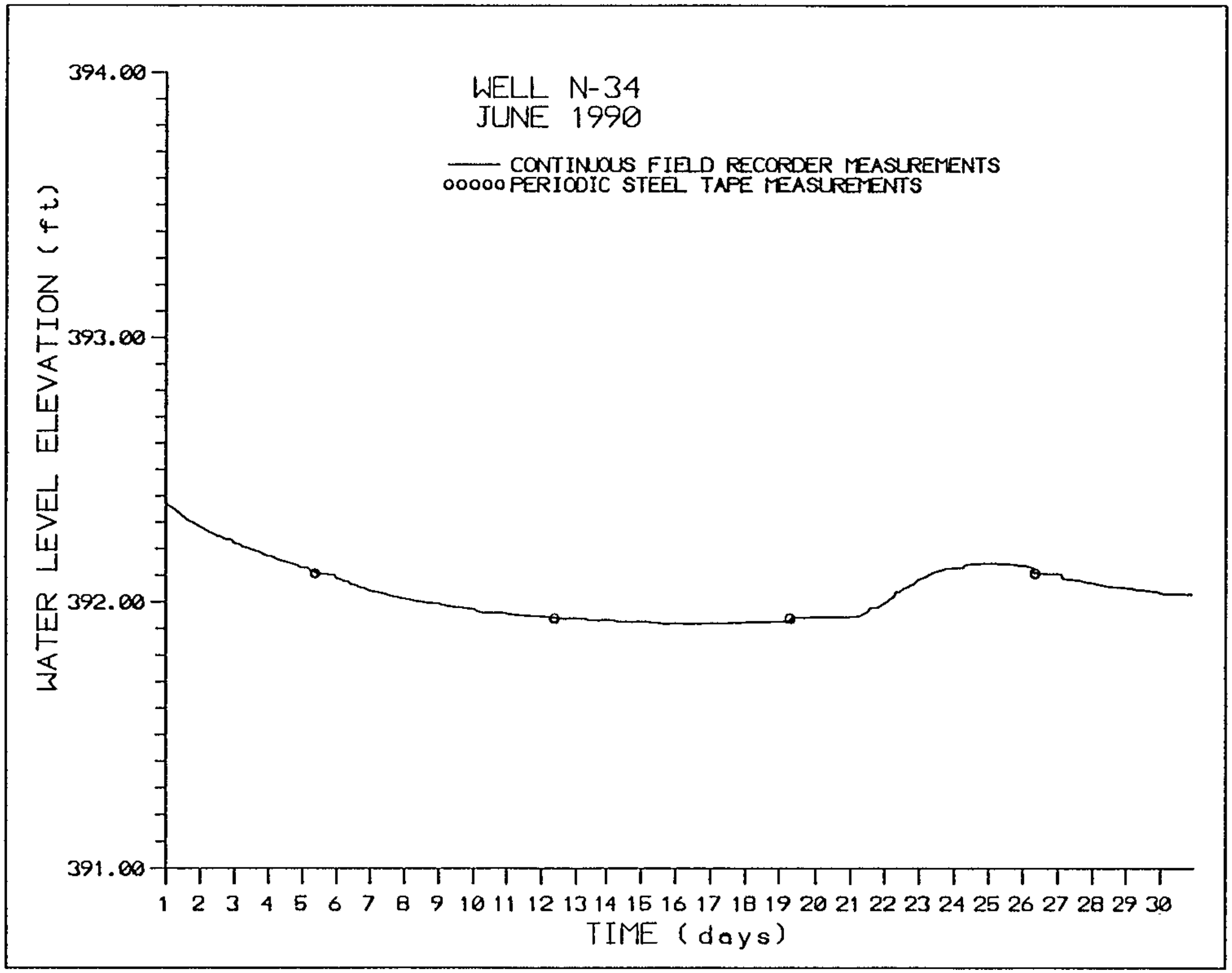
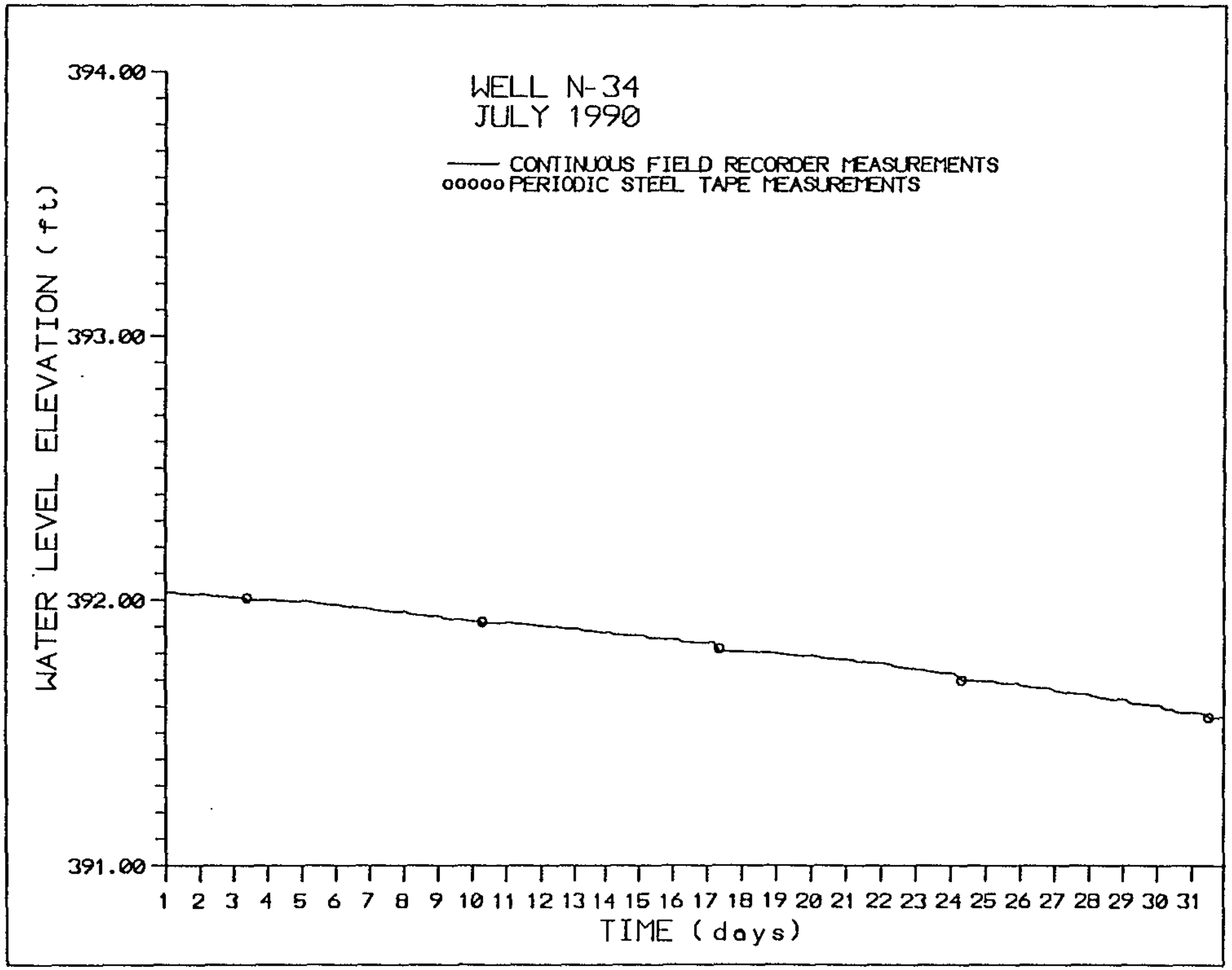
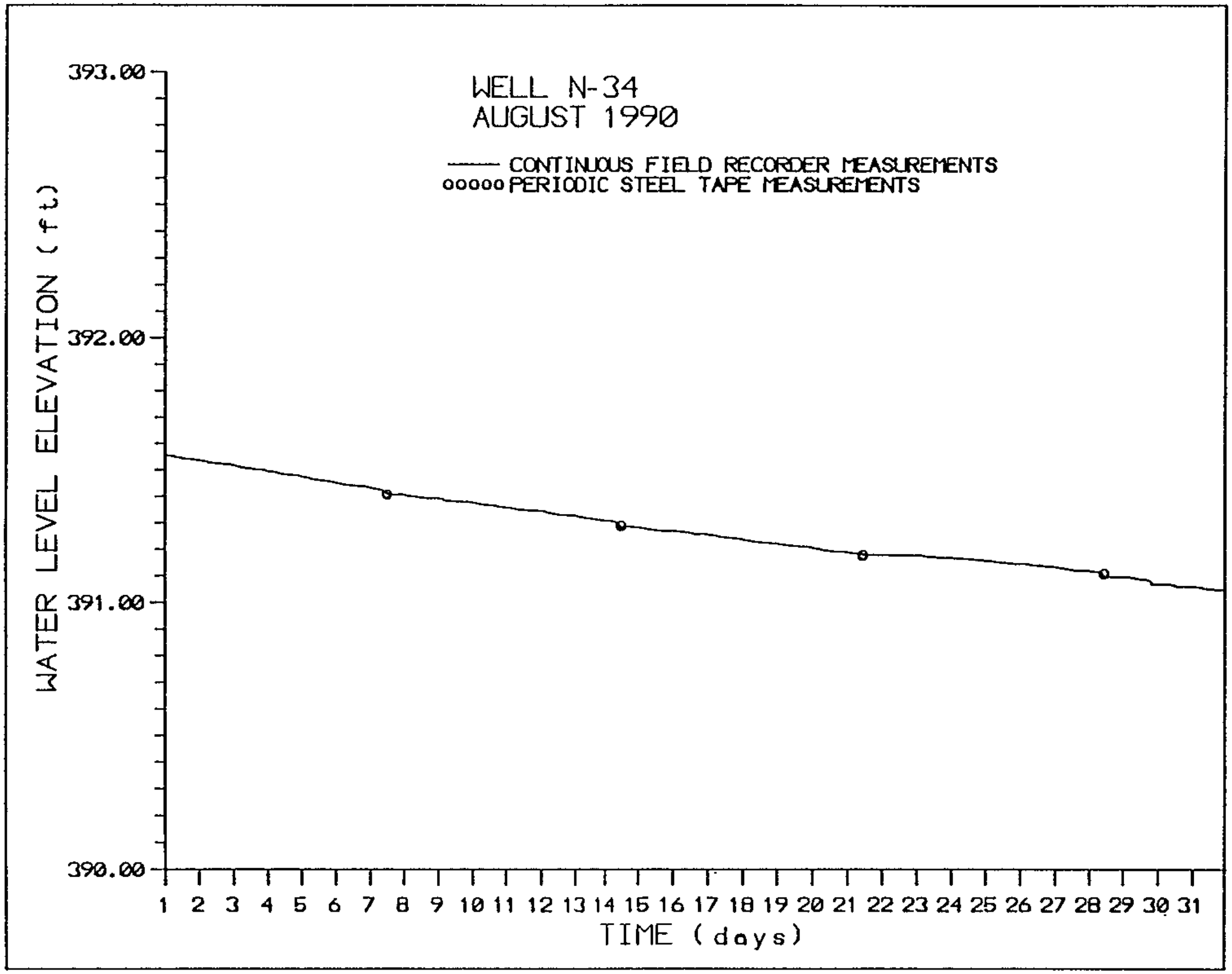
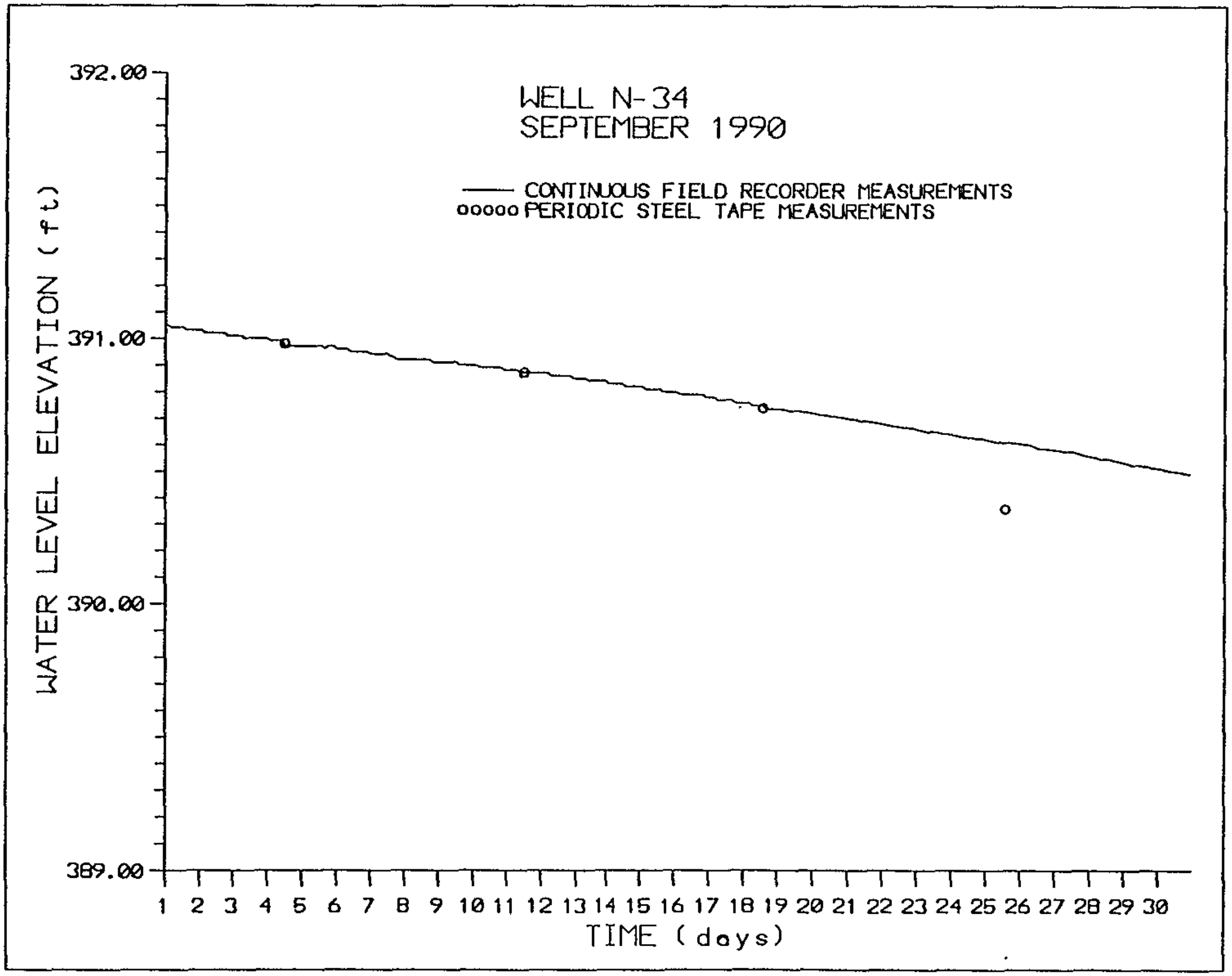
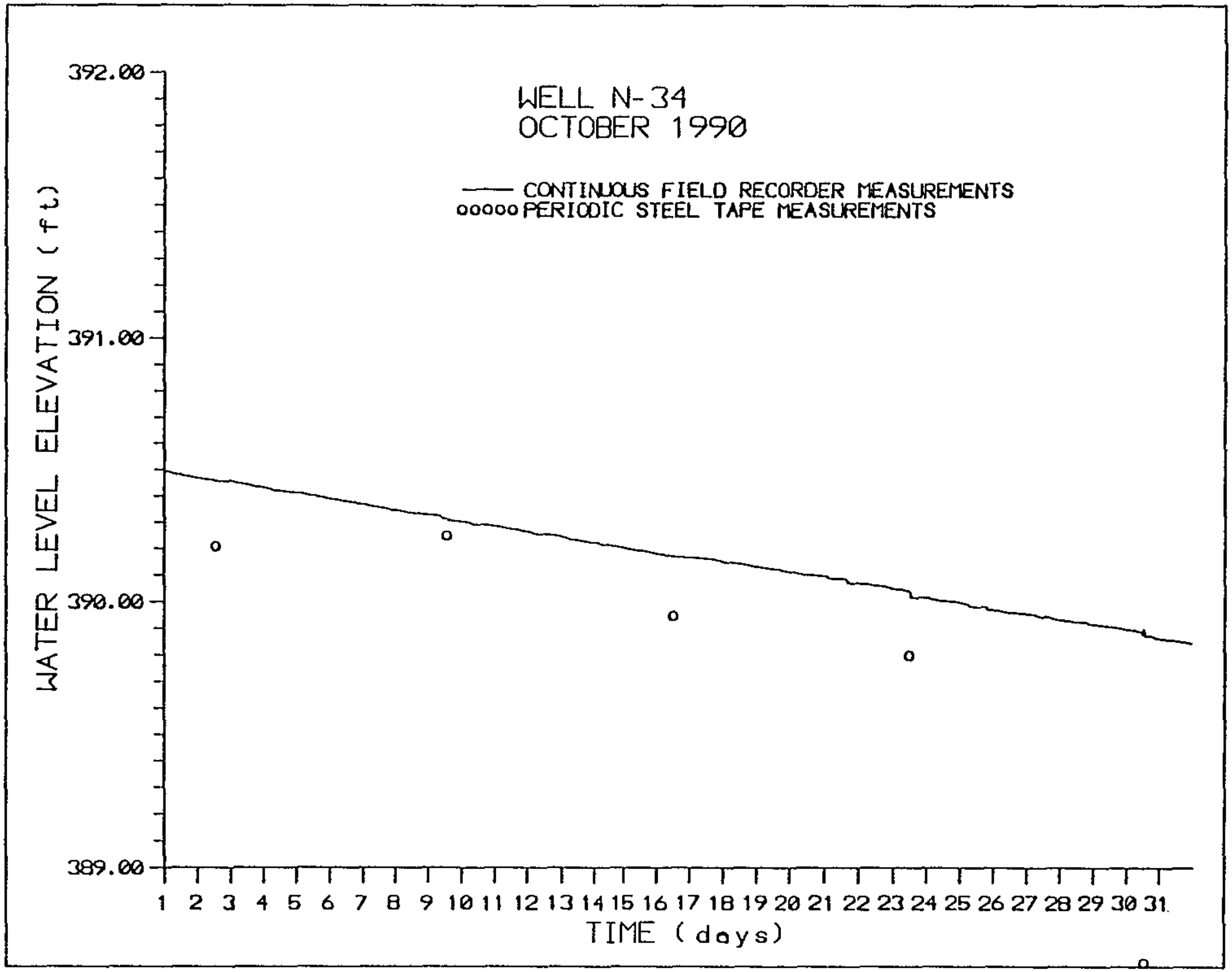


A.61

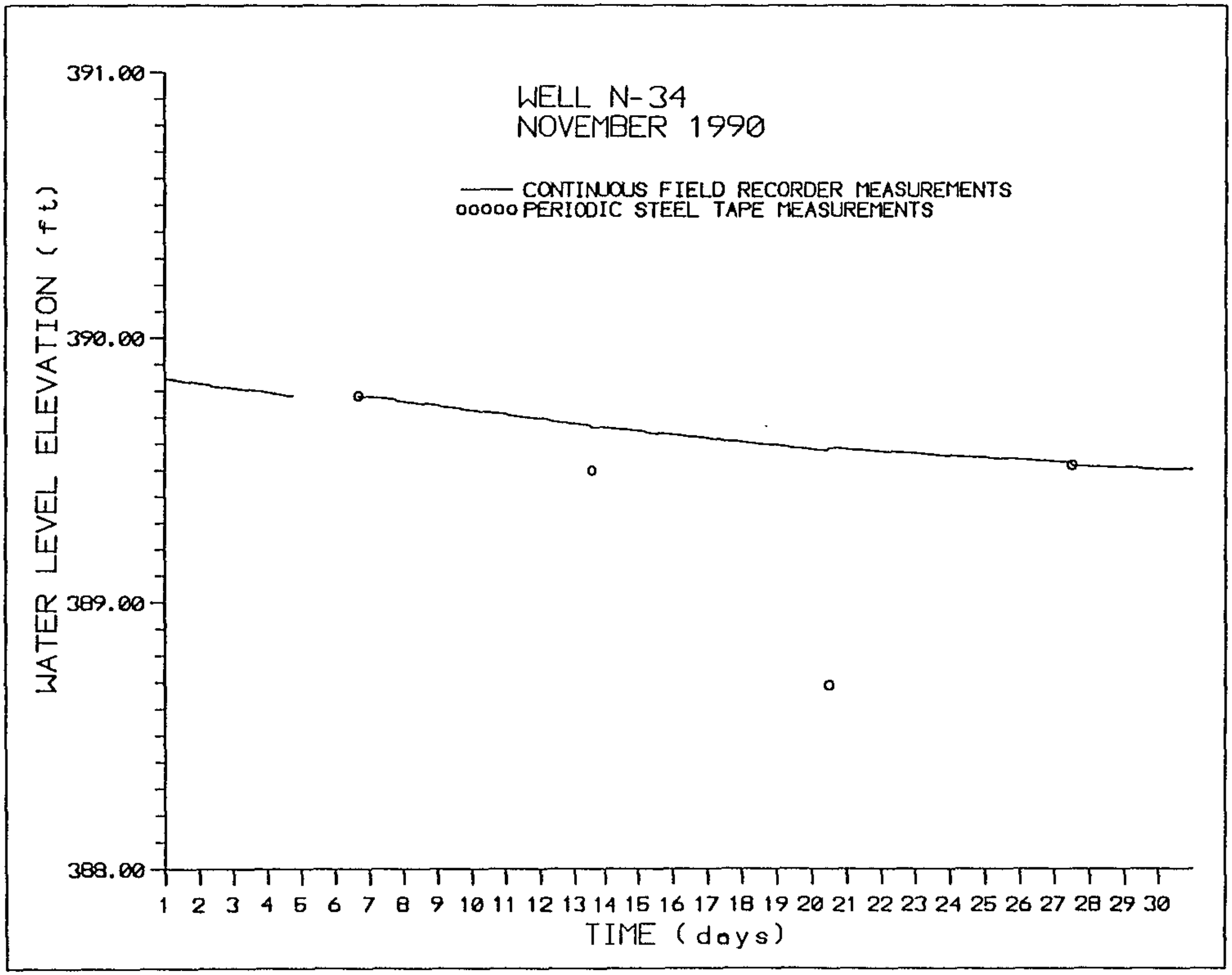

WELL N-34
JULY 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
394.00
393.00
392.00
391.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

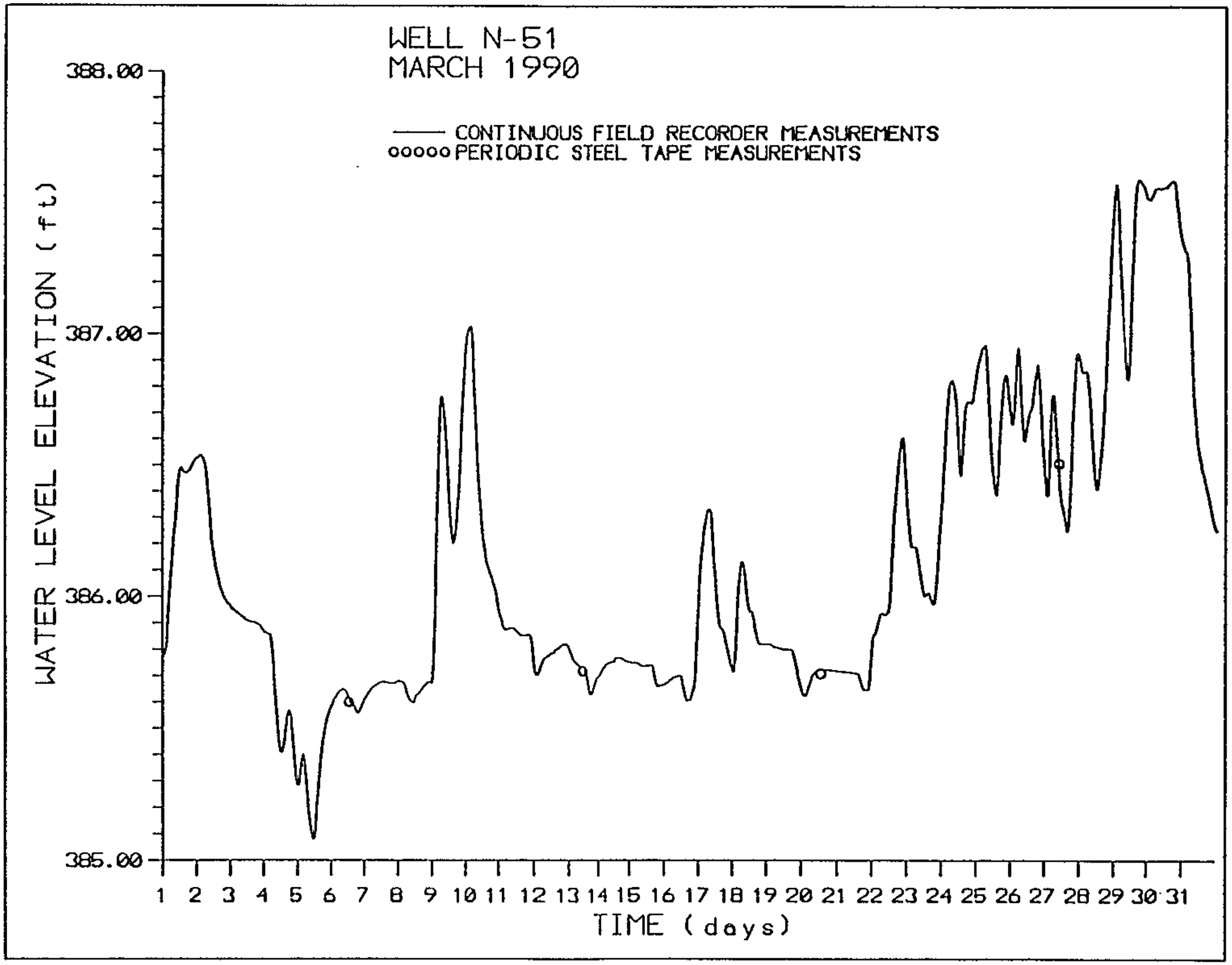

WELL N-34
AUGUST 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
393.00
392.00
391.00
390.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

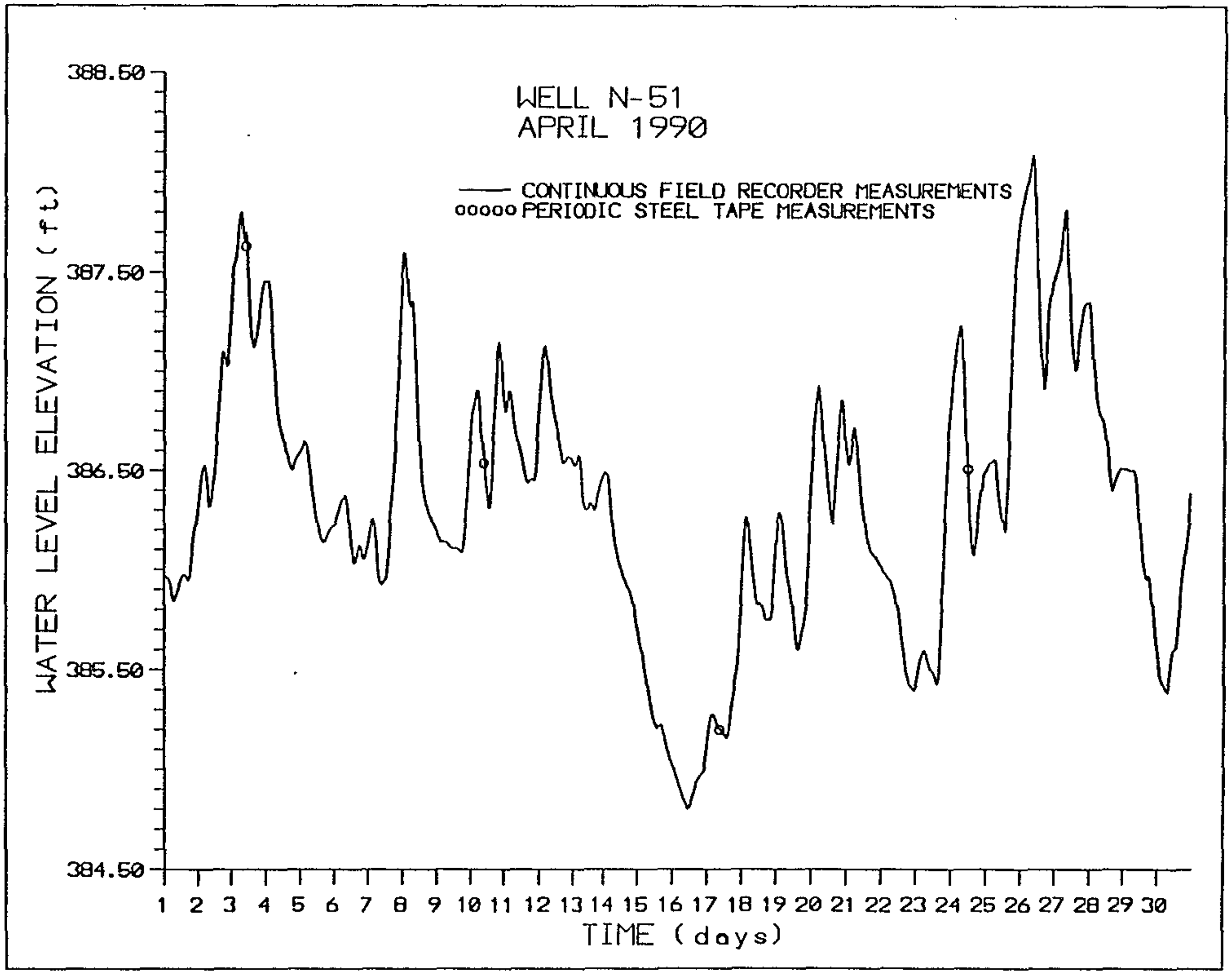

WELL N-34
SEPTEMBER 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
392.00
391.00
390.00
389.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)


WELL N-34
OCTOBER 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
392.00
391.00
390.00
389.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

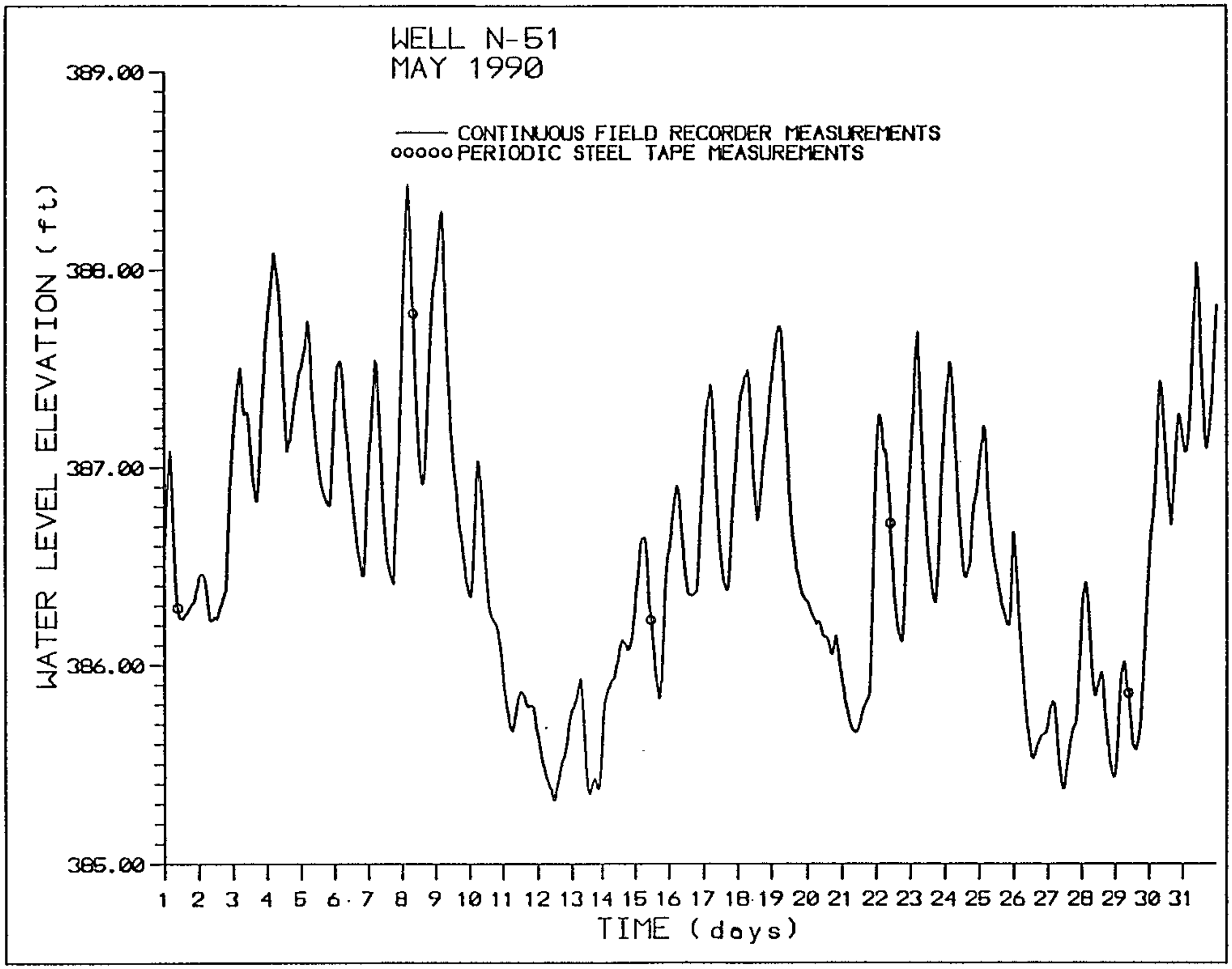
9413282.0092



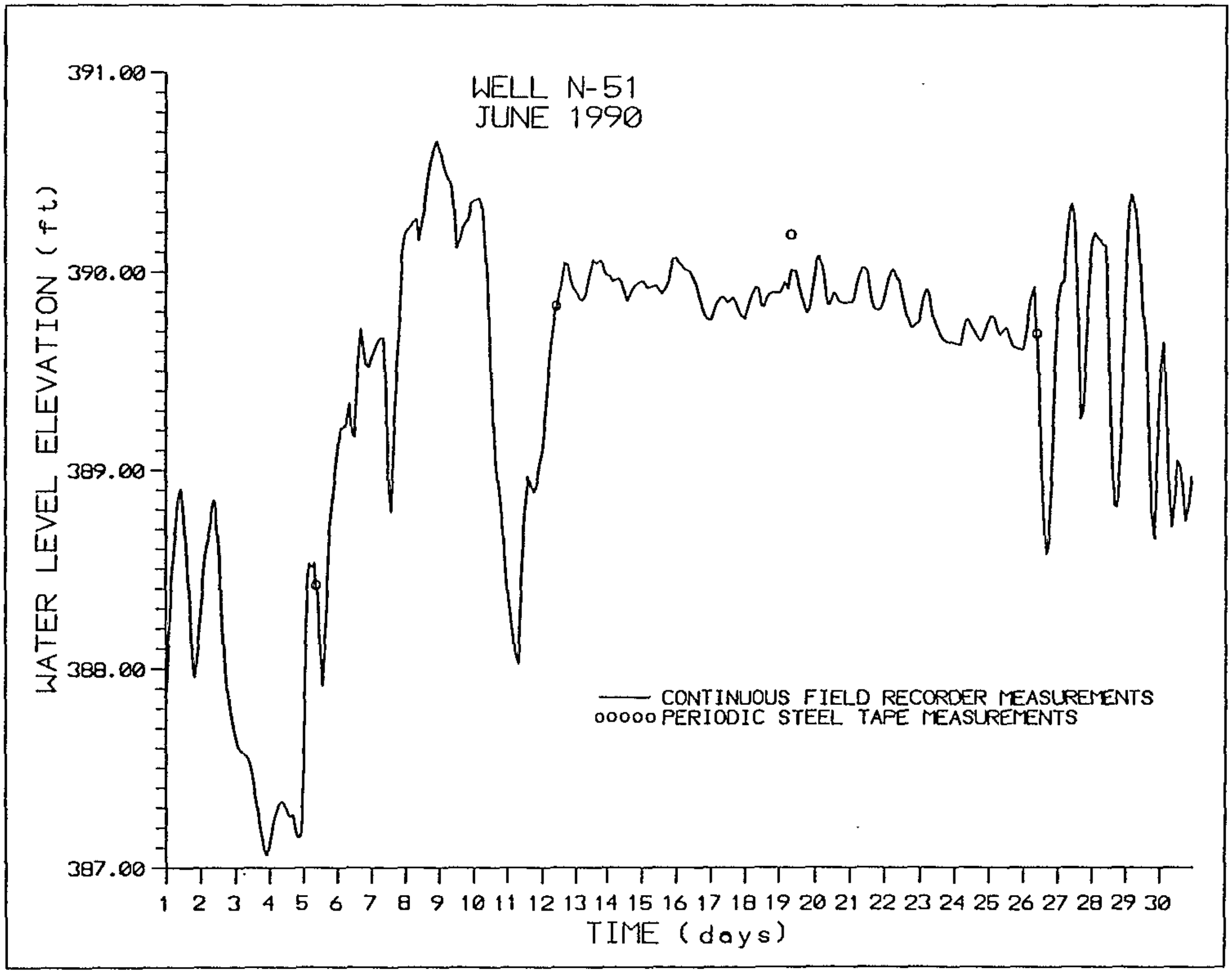

WELL N-51
MARCH 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
388.00
387.00
386.00
385.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)


WELL N-51
APRIL 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
388.50
387.50
386.50
385.50
384.50
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)

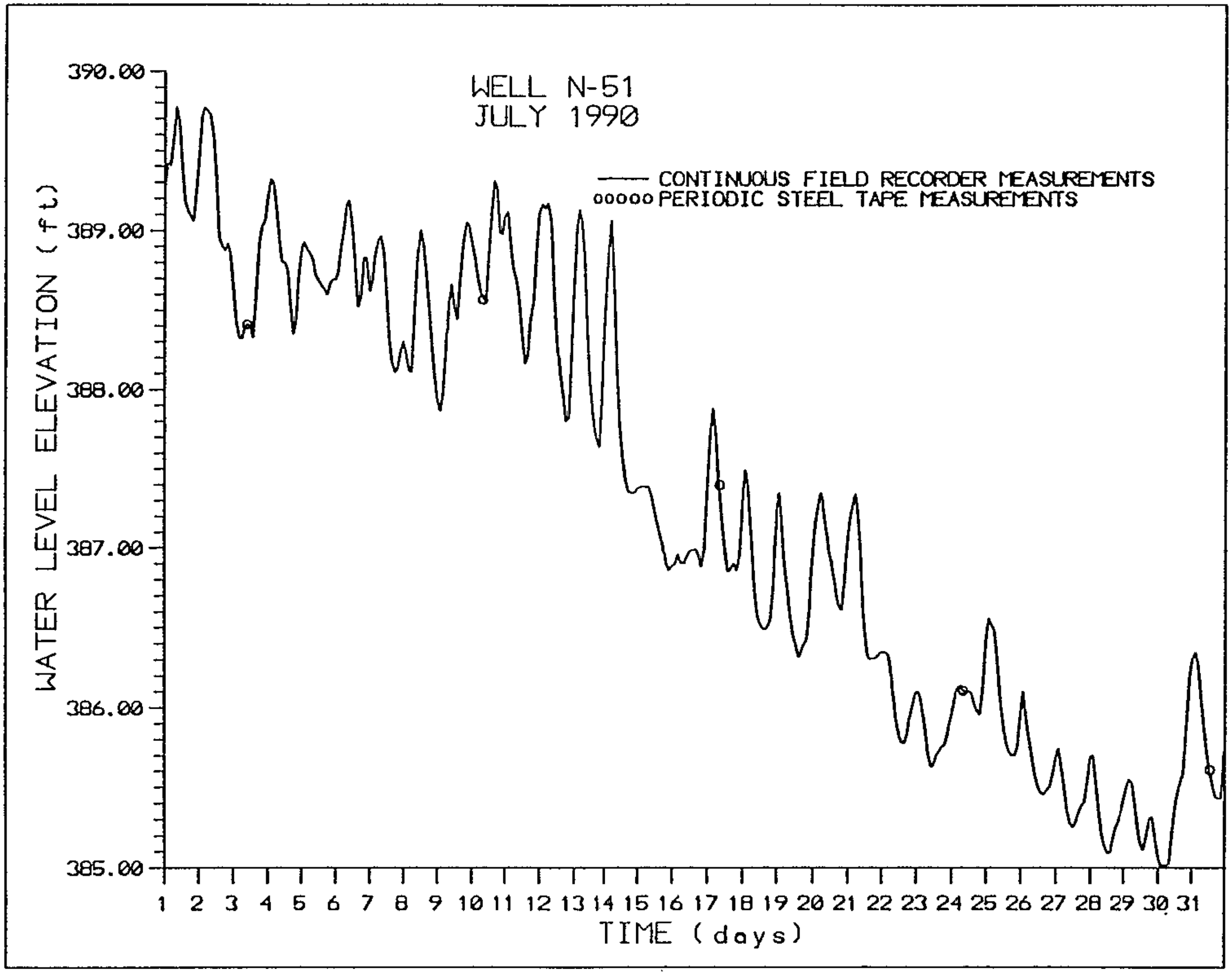
9413282.0095

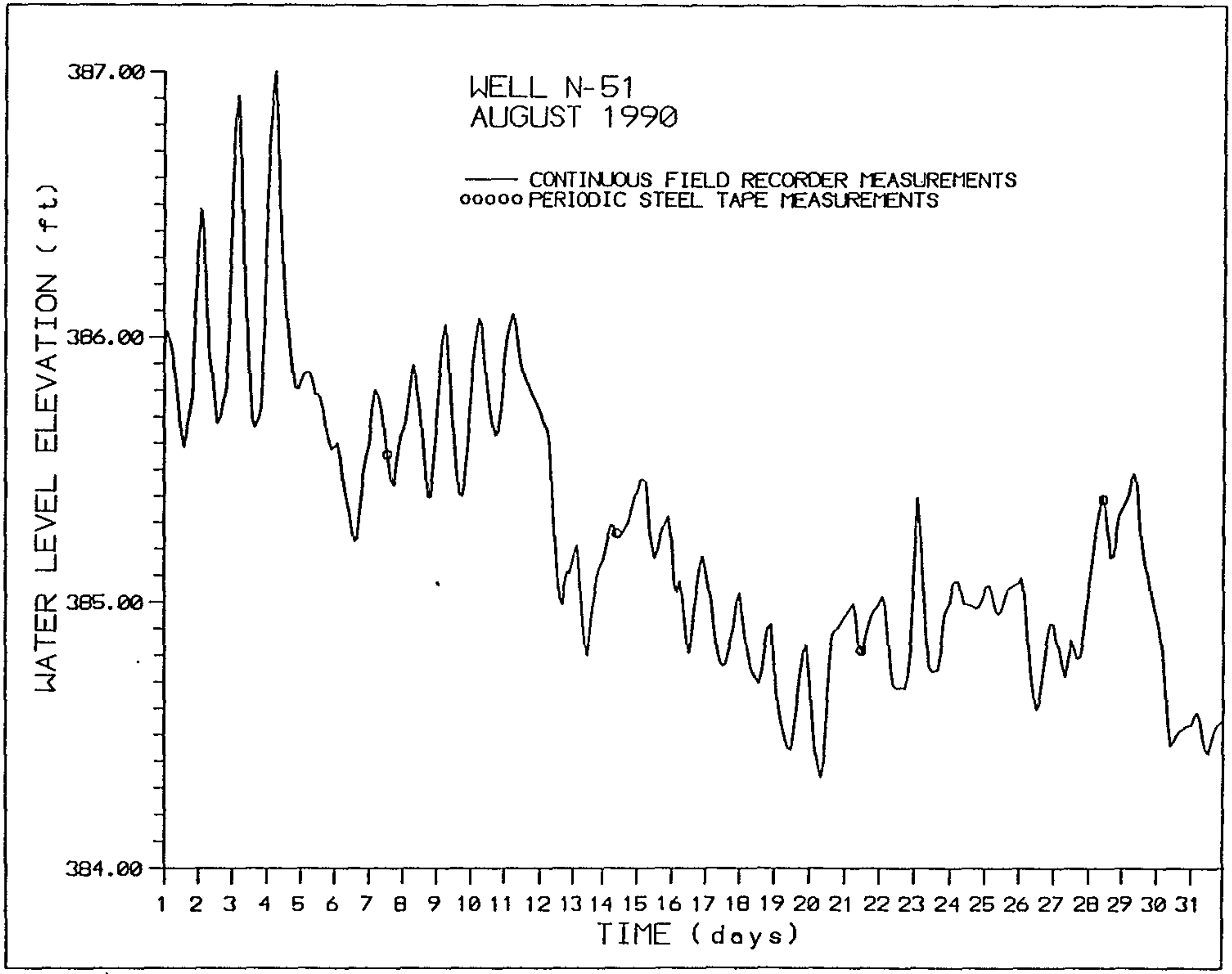


A.69

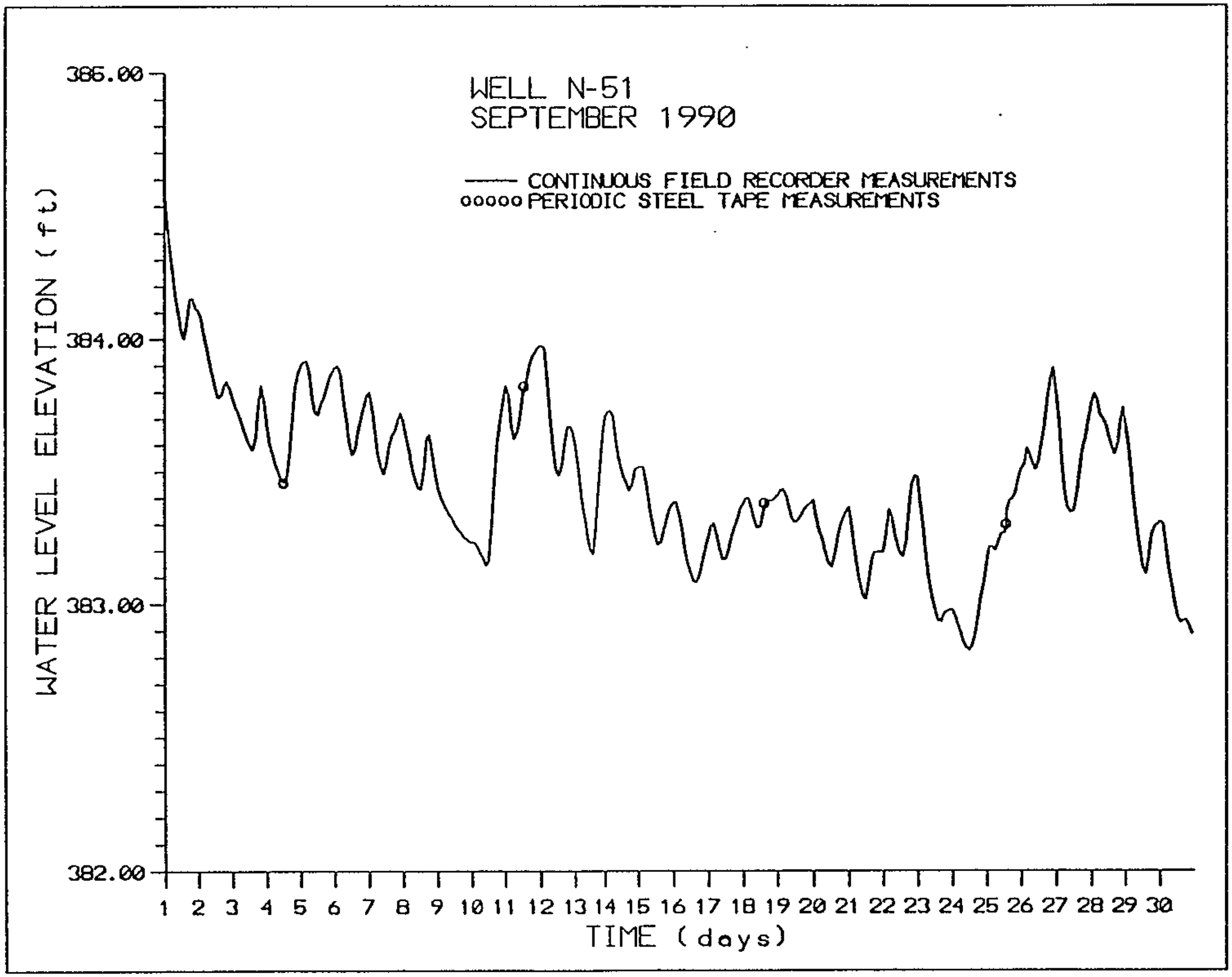


WELL N-51
JUNE 1990
391.00
390.00
389.00
388.00
387.00
WATER LEVEL ELEVATION (ft)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS


WELL N-51
JULY 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
390.00
389.00
388.00
387.00
386.00
385.00
TIME (days)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31


WELL N-51
AUGUST 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
387.00
386.00
385.00
384.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

9413282.0099



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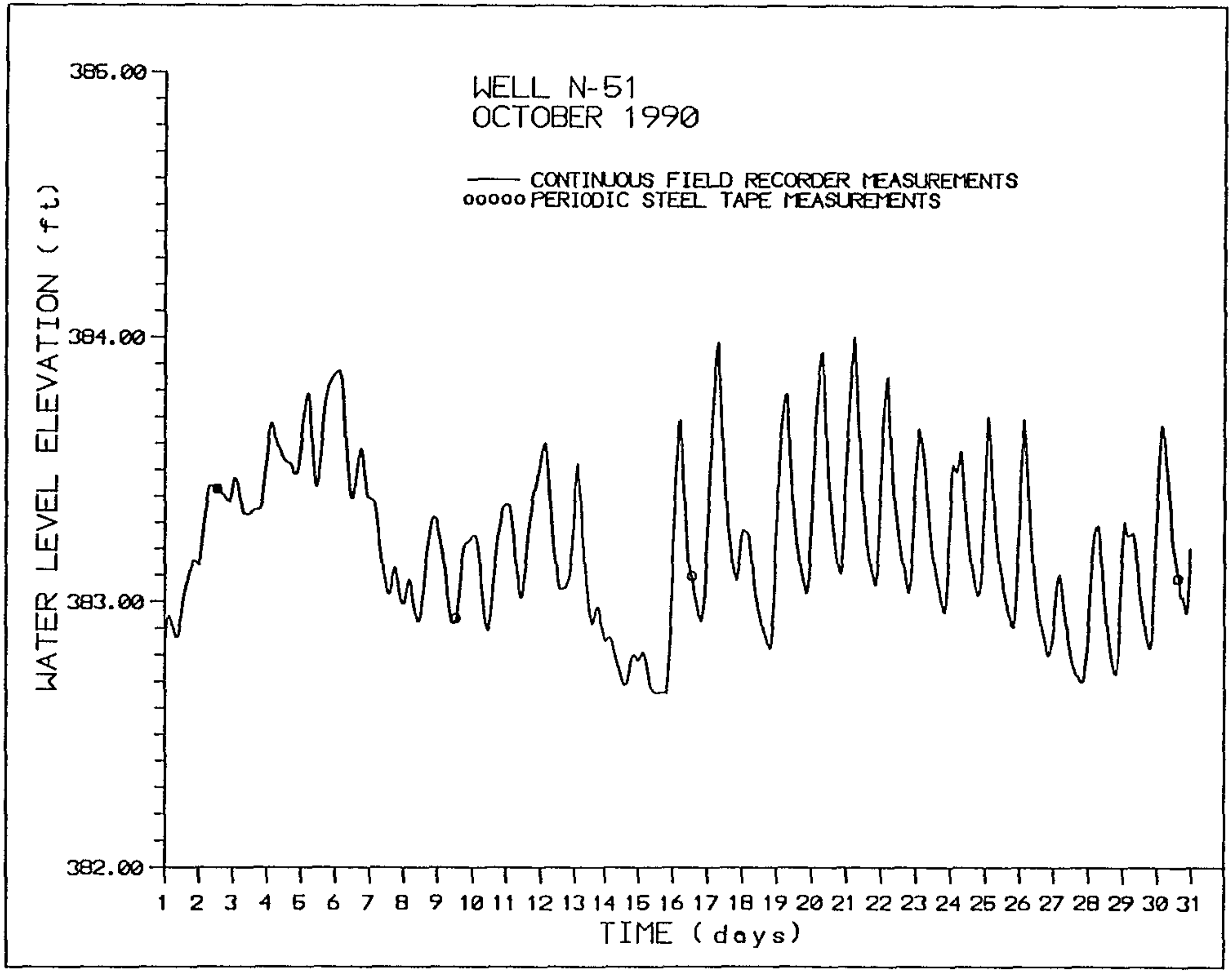
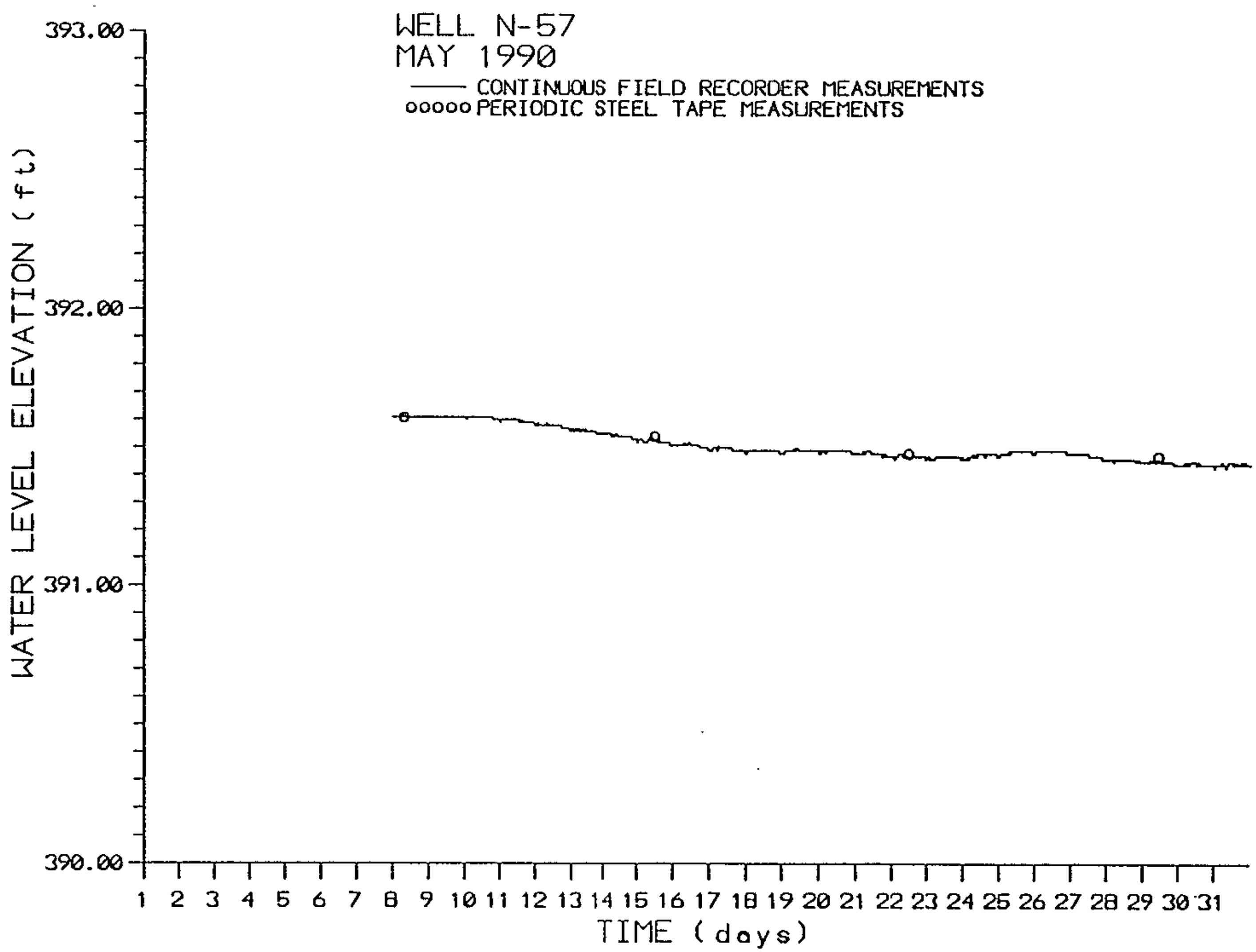
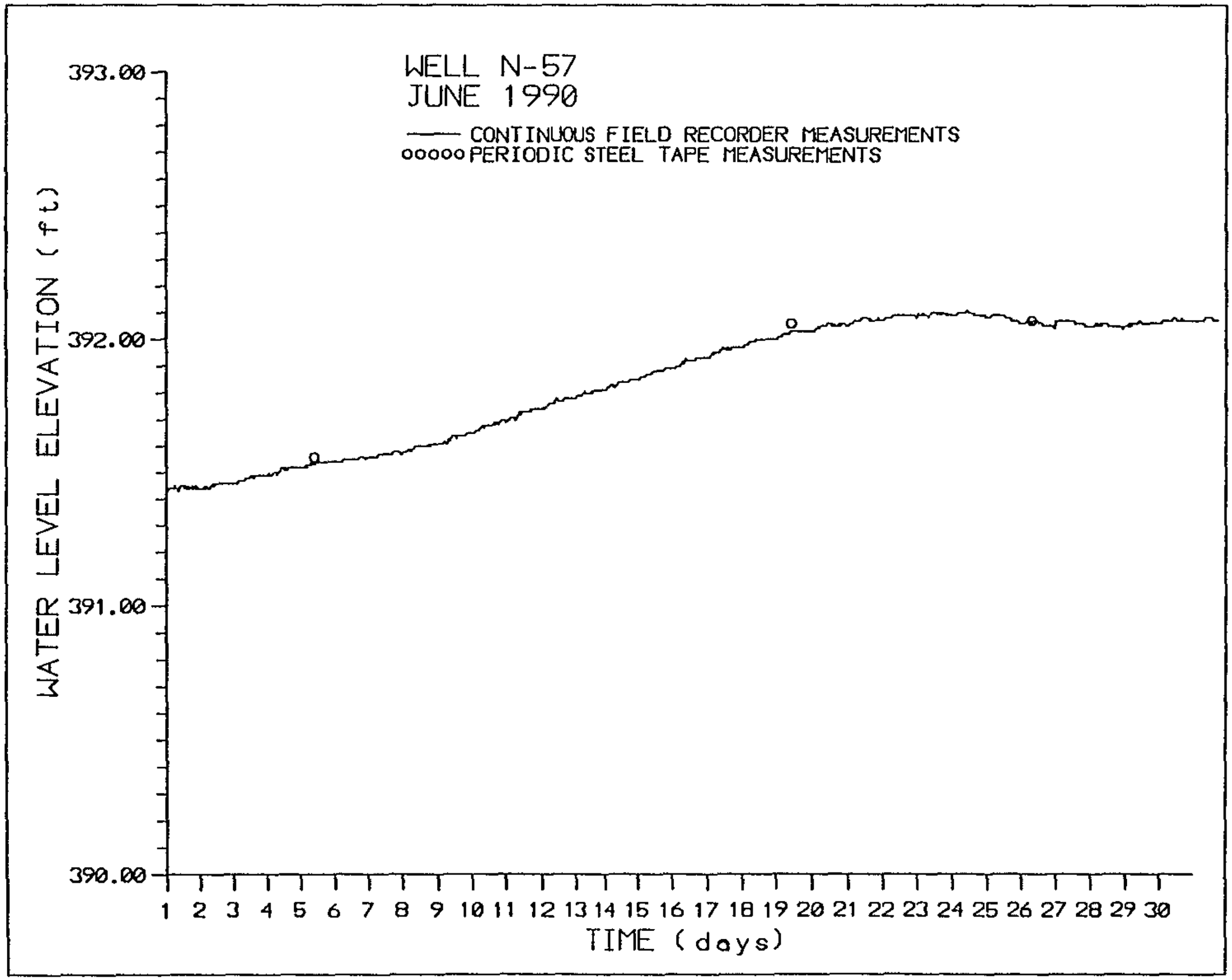


A.74

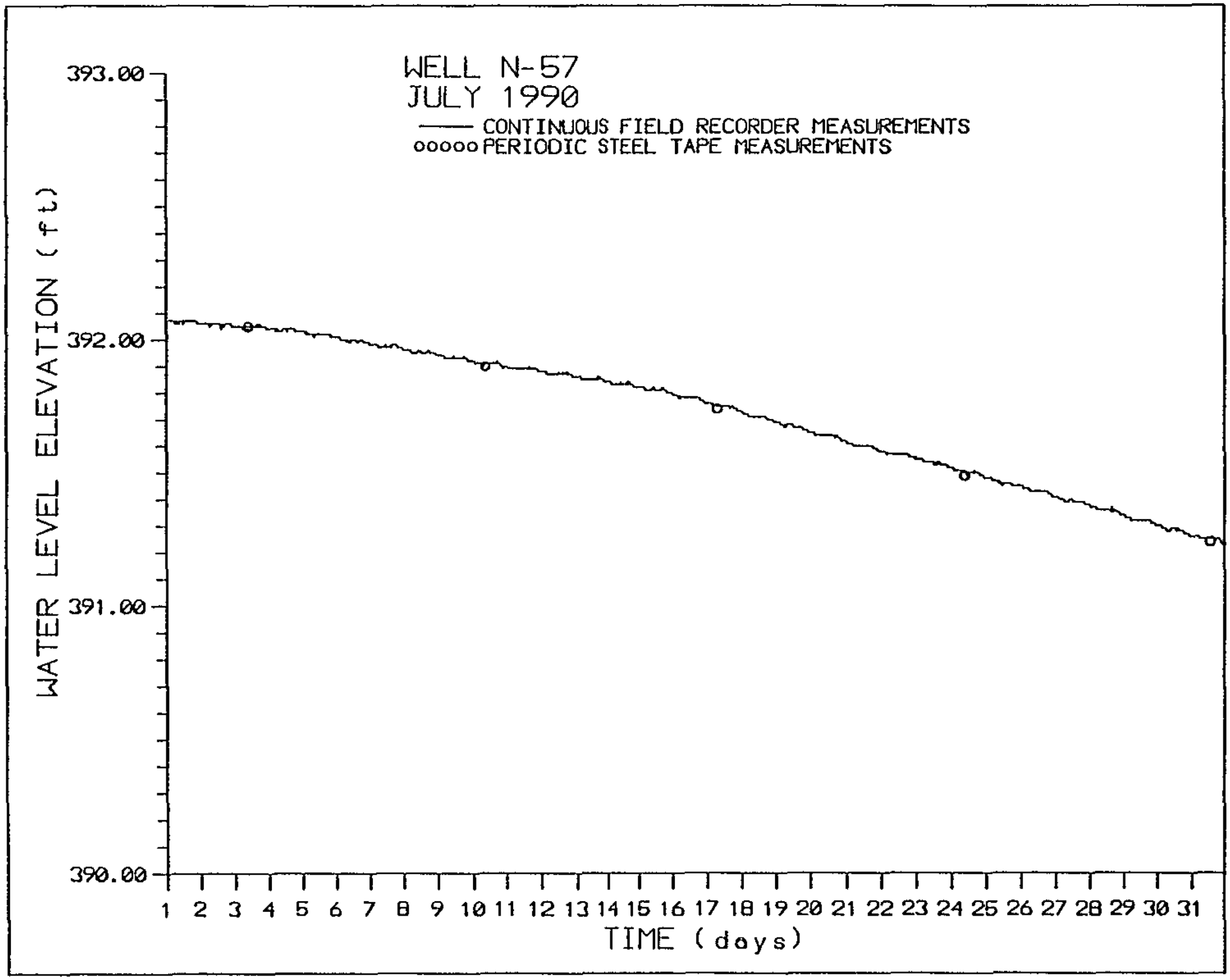

WELL N-57
MAY 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
393.00
392.00
391.00
390.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

9413282.0102

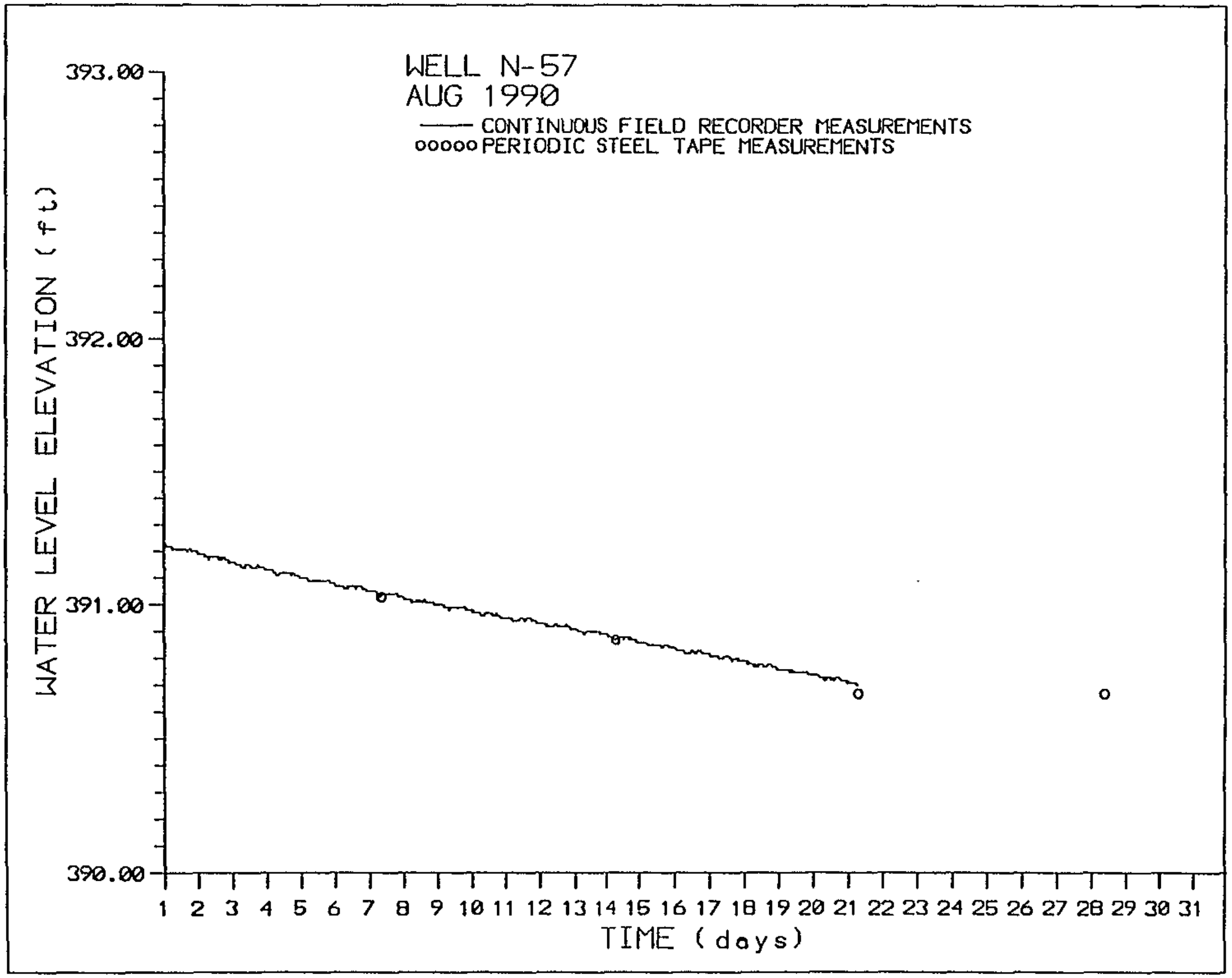


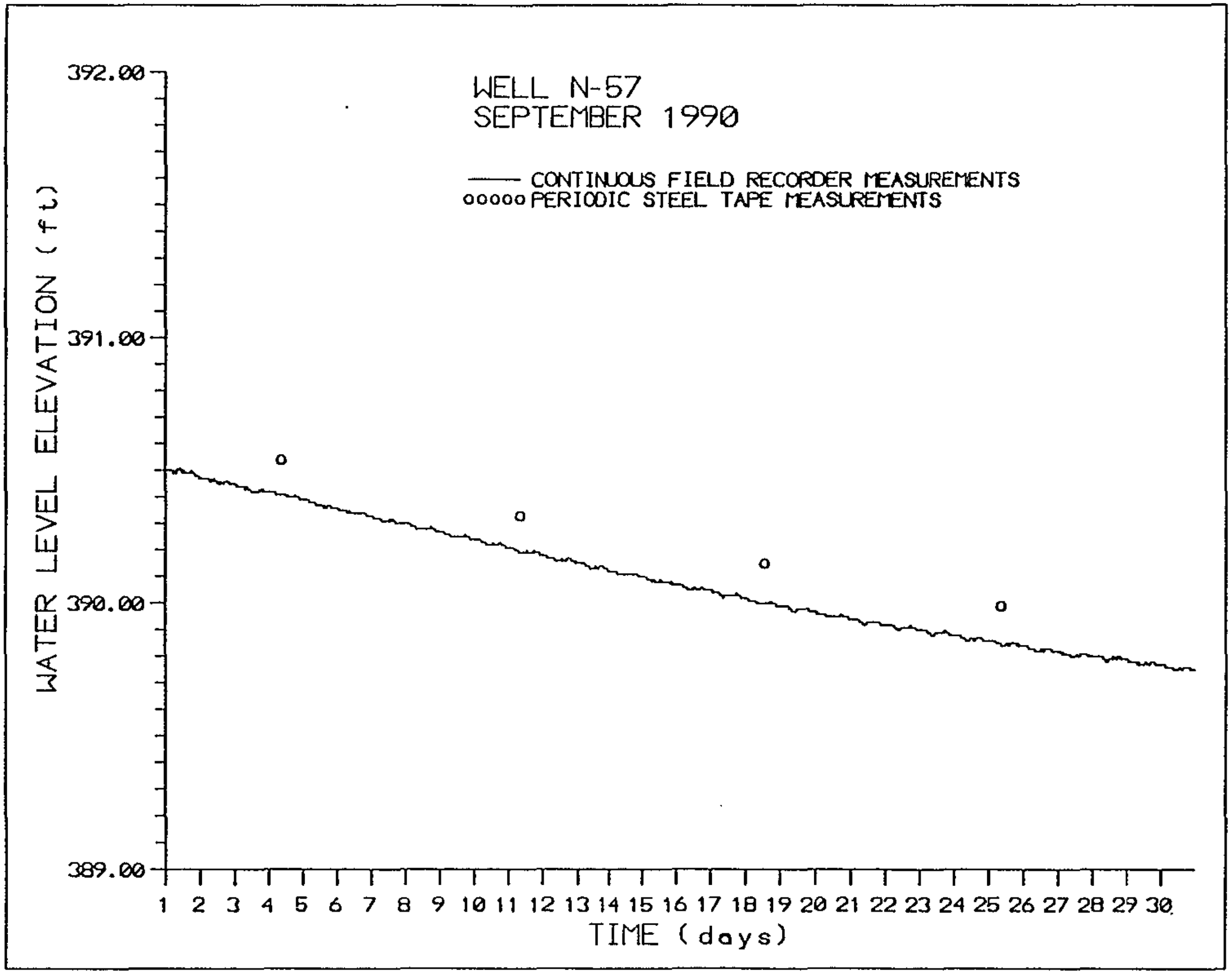
A.76

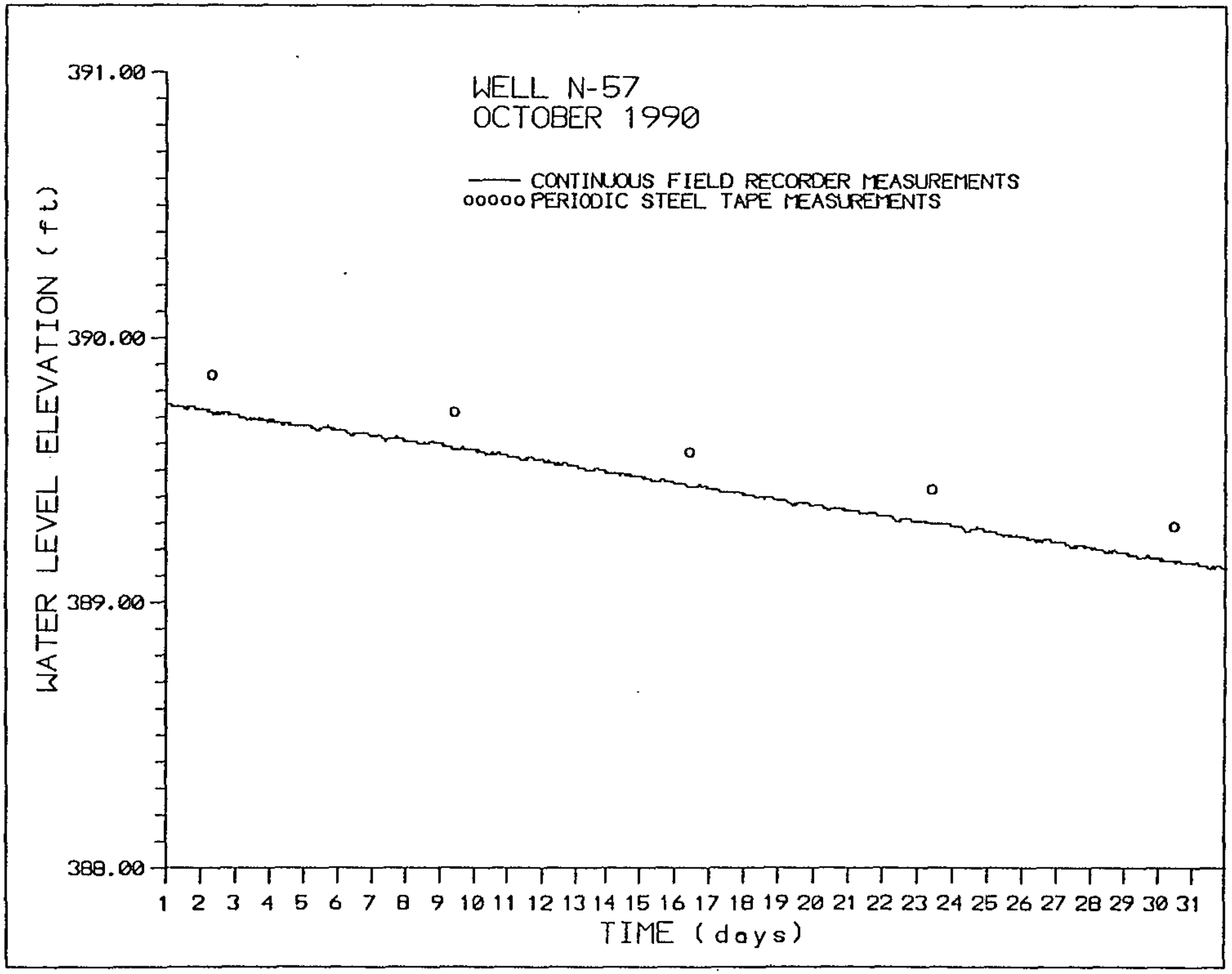
9413282.0103

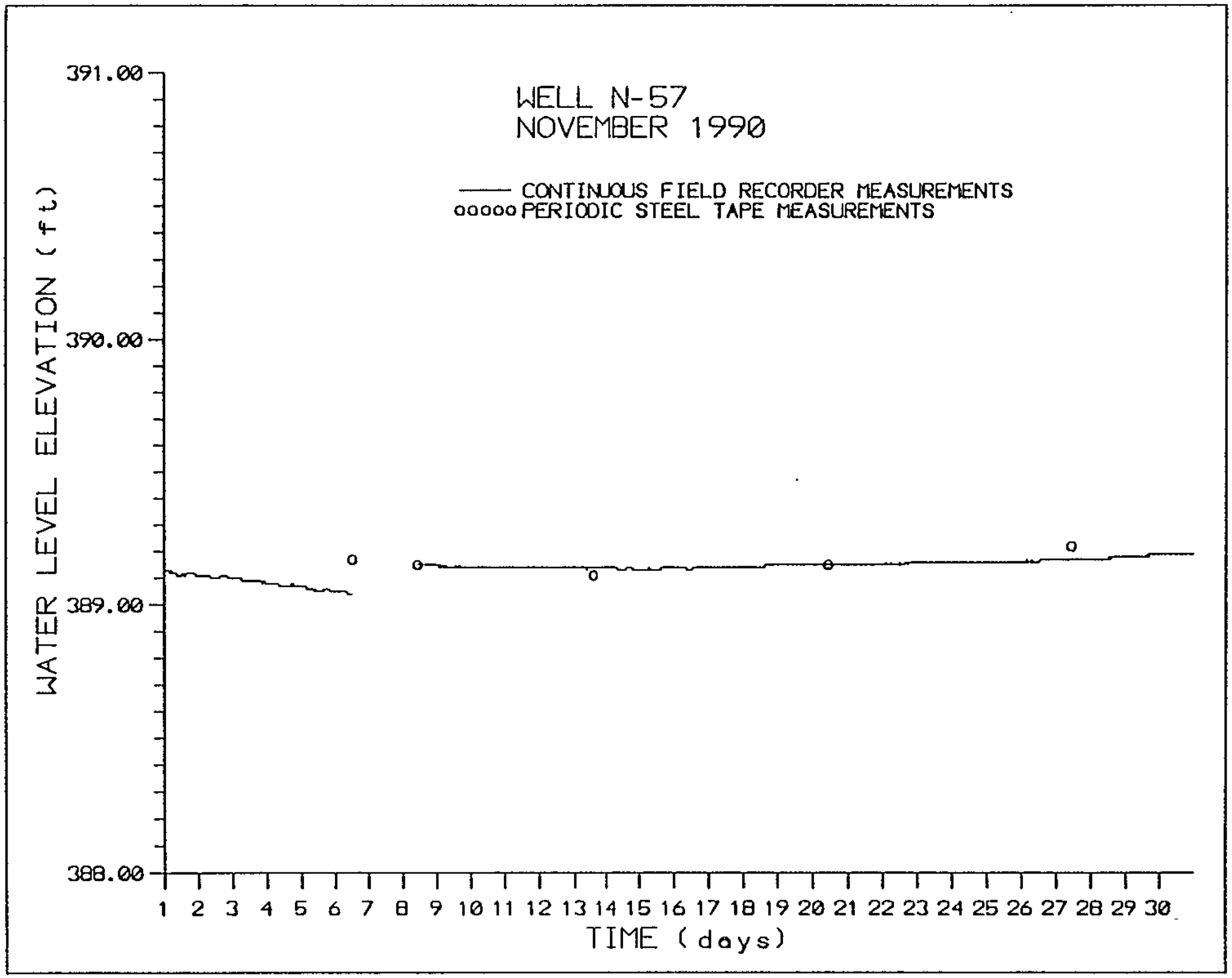


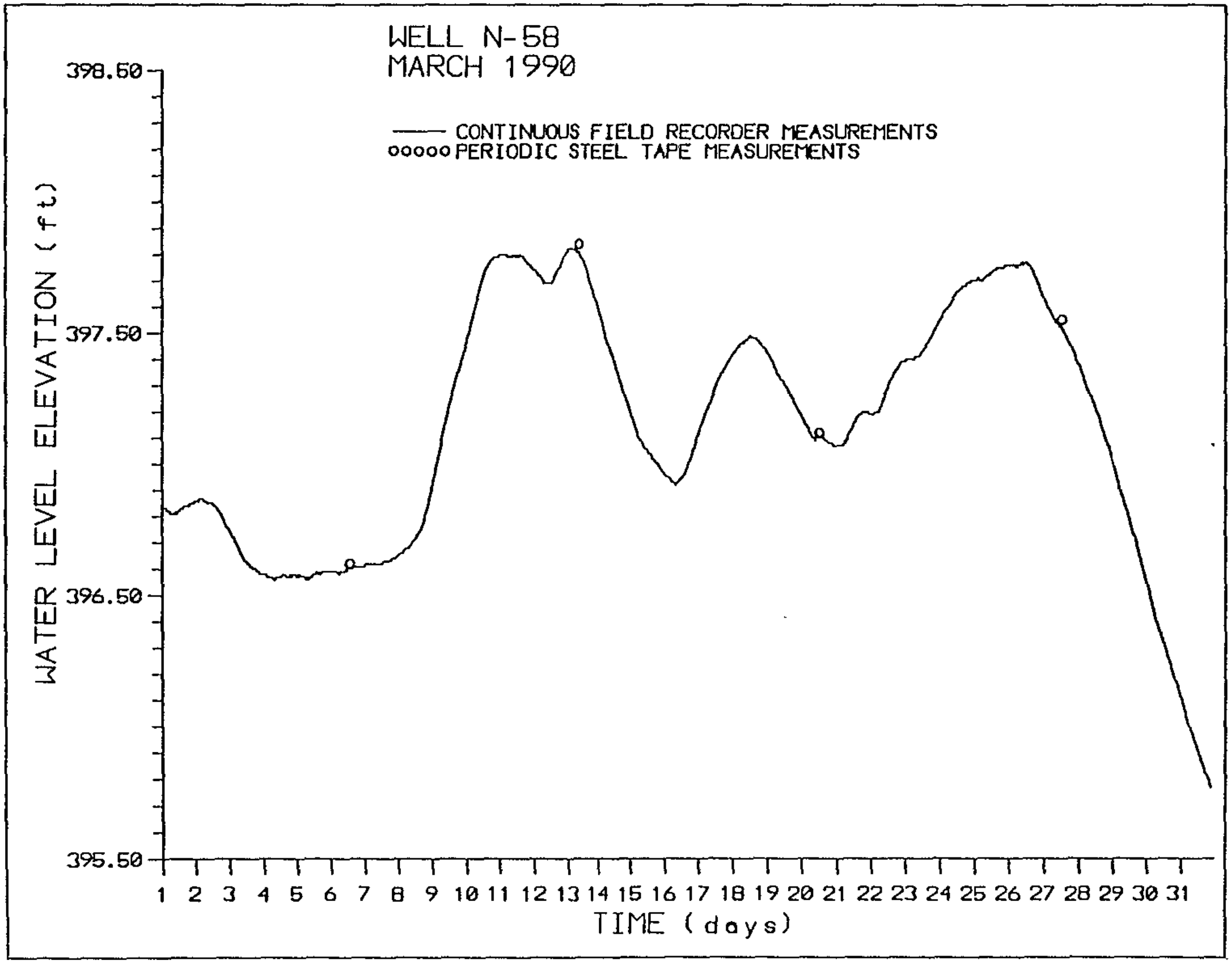
9413282.0104

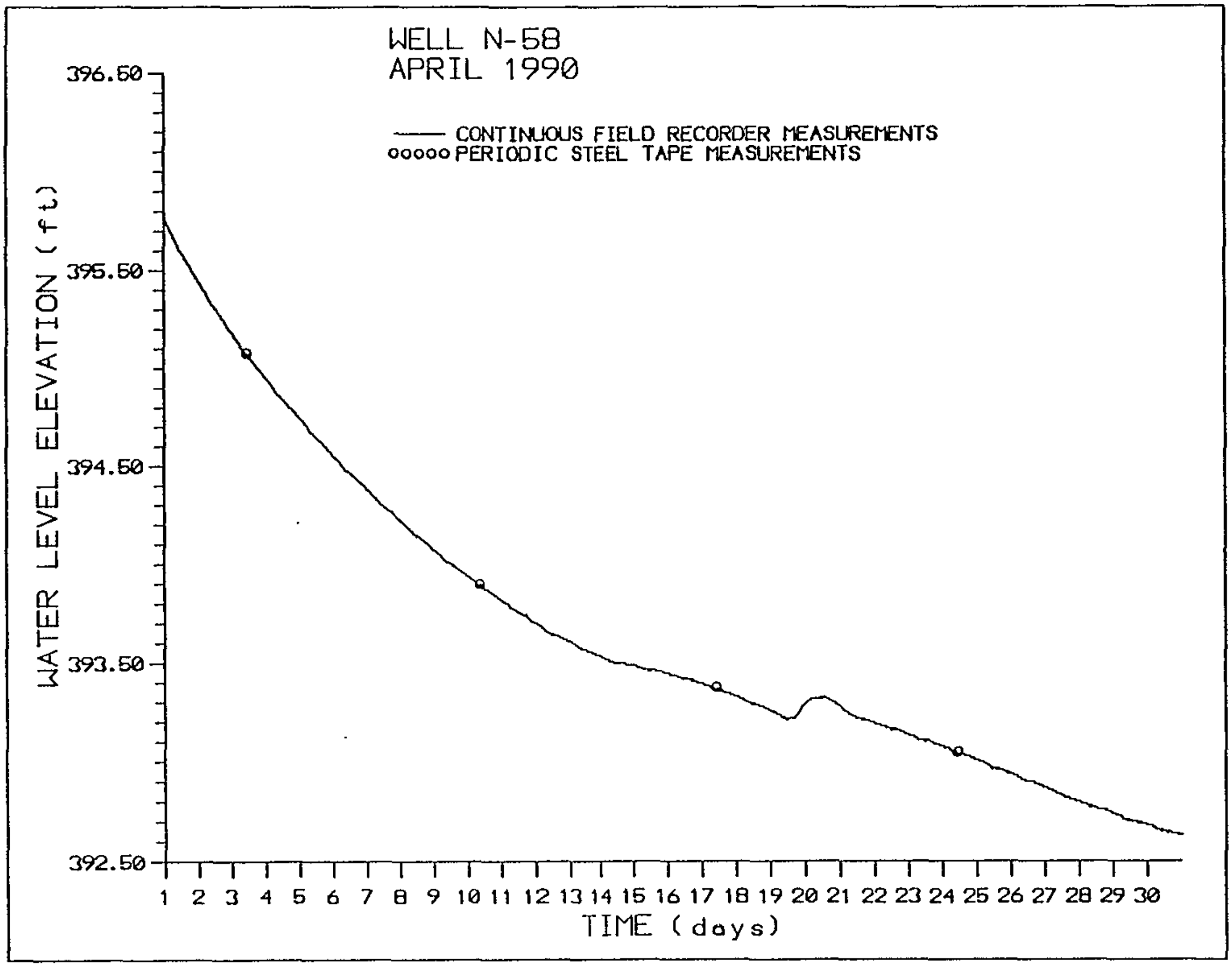



WELL N-57
SEPTEMBER 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
392.00
391.00
390.00
389.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)

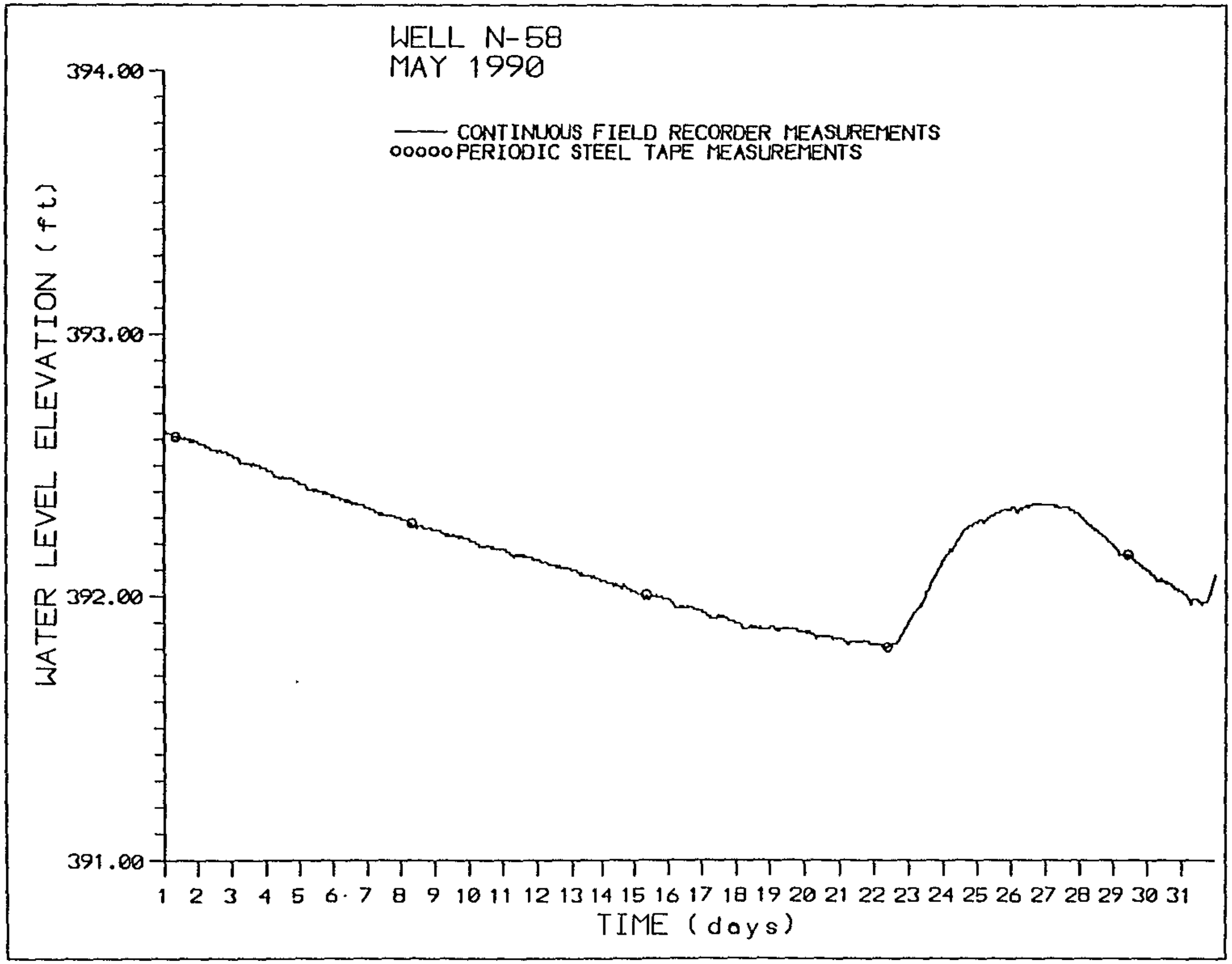

WELL N-57
OCTOBER 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
391.00
390.00
389.00
388.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

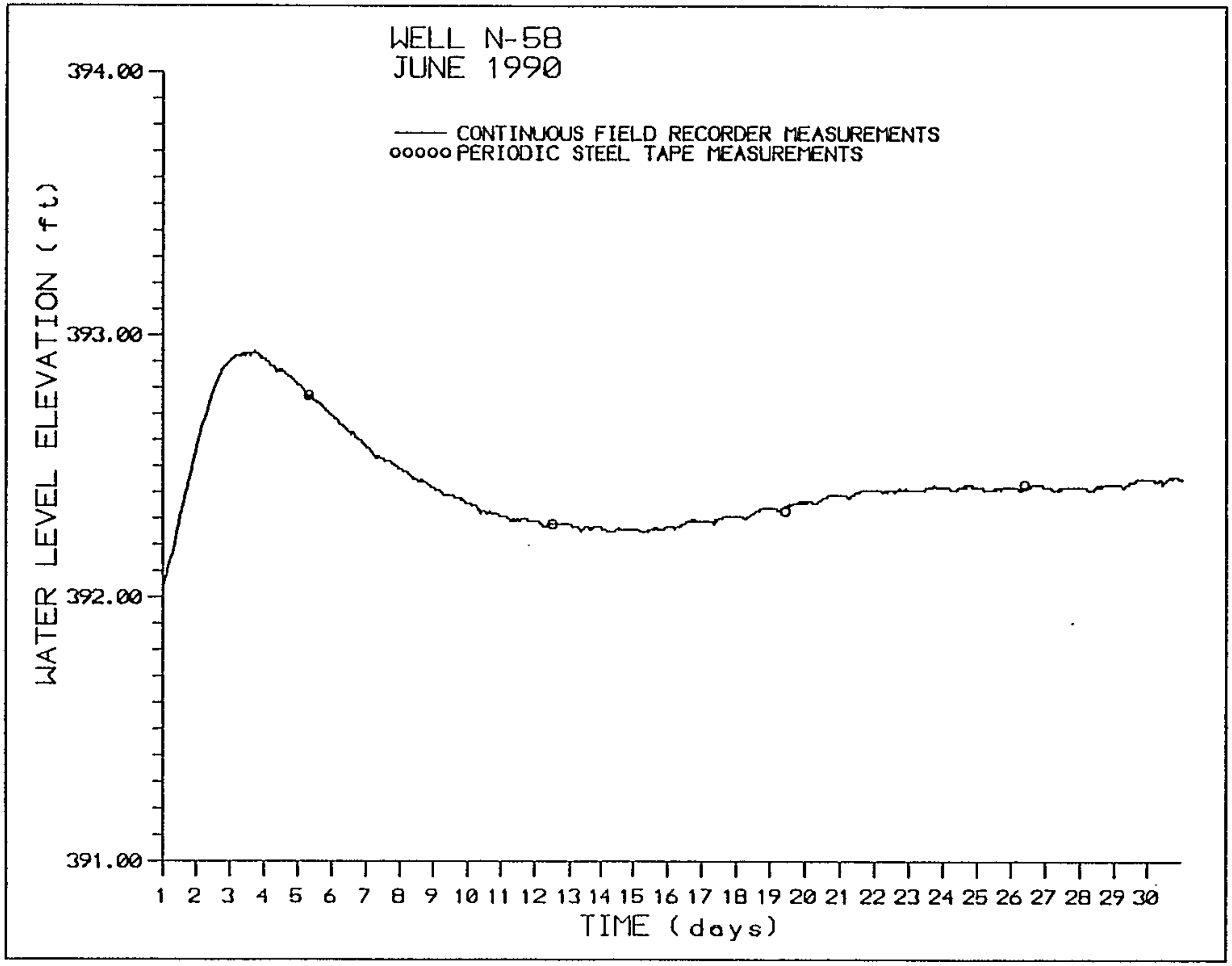

WELL N-57
NOVEMBER 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
391.00
390.00
389.00
388.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)

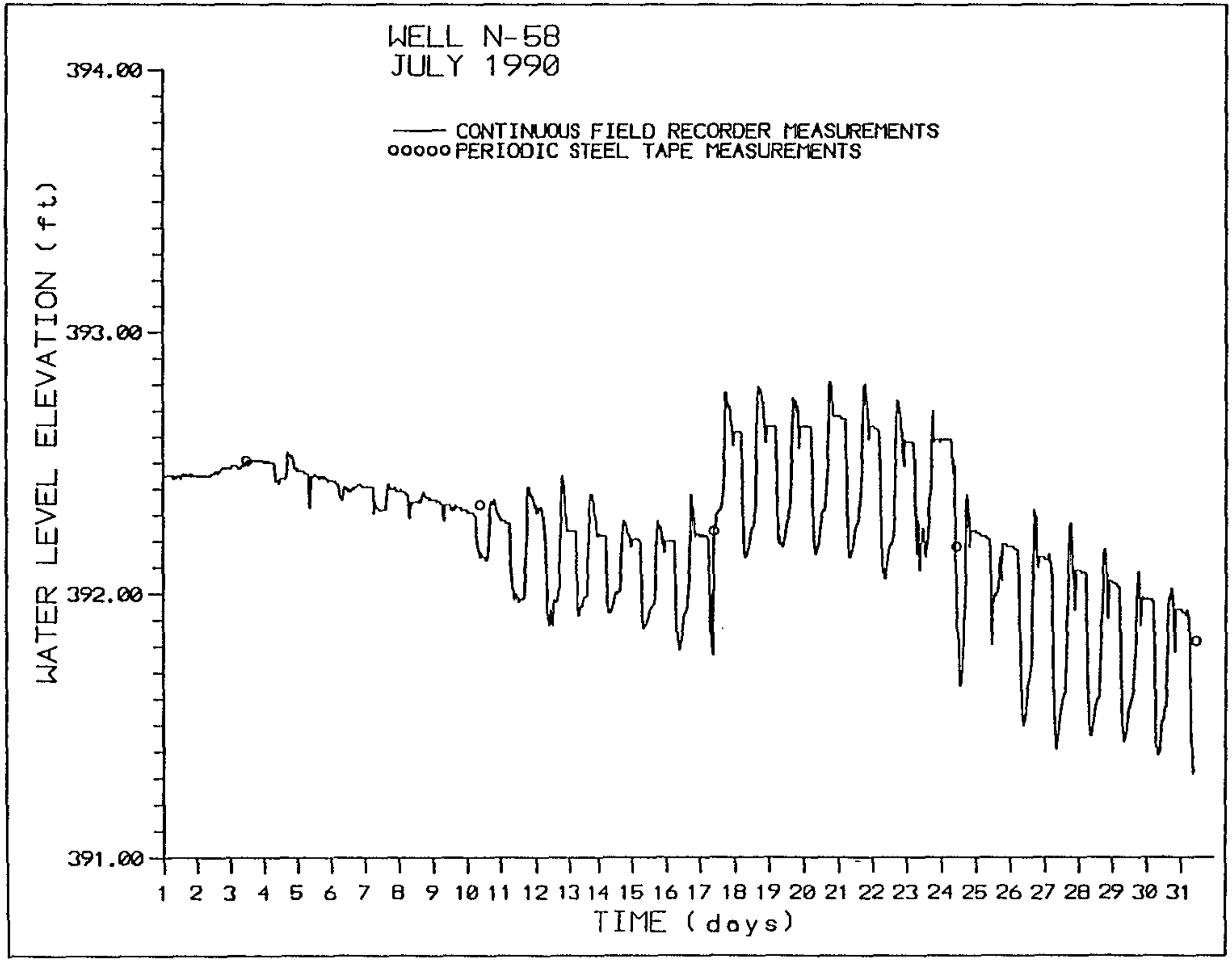

WELL N-58
MARCH 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
398.50
397.50
396.50
395.50
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

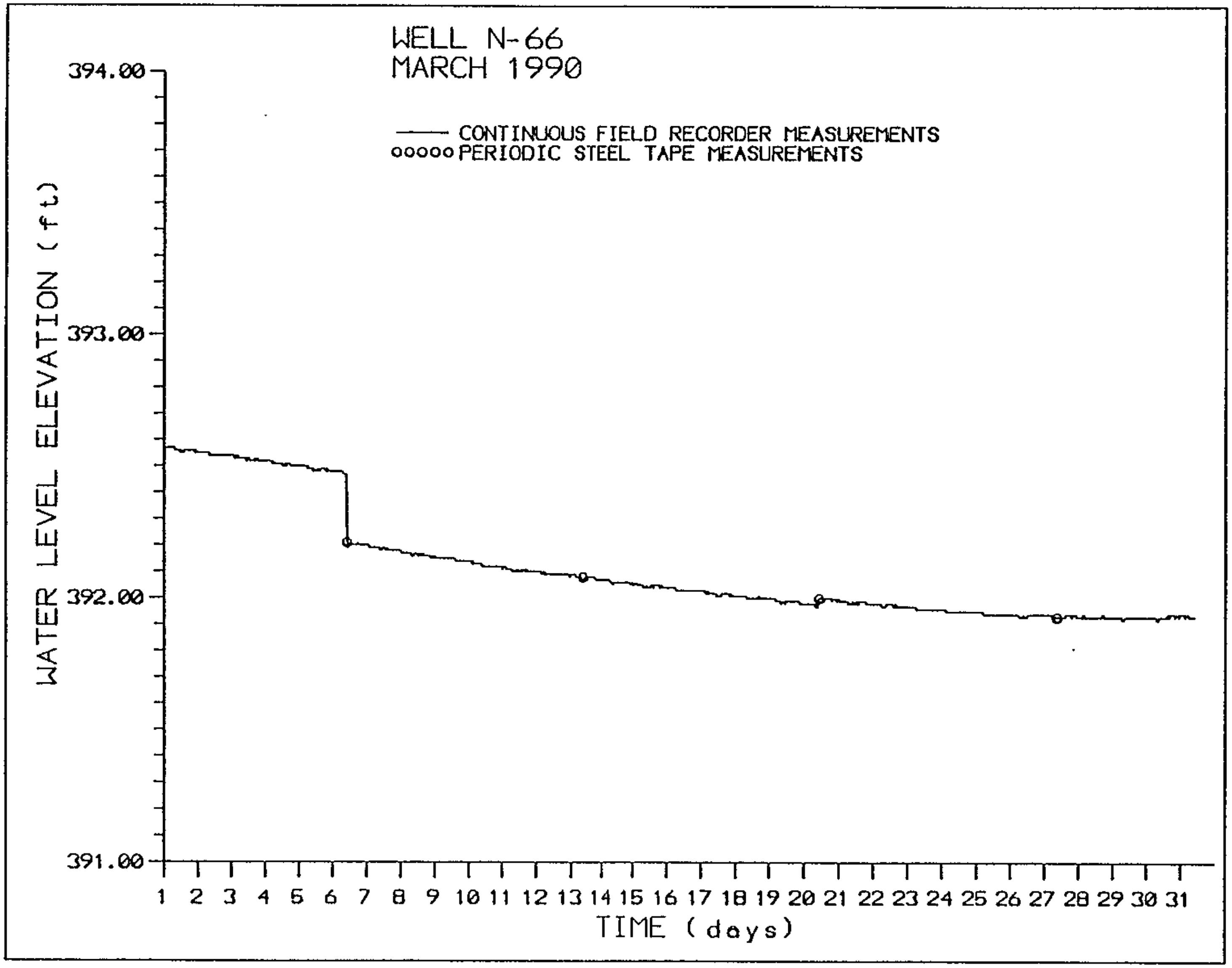

WELL N-58
APRIL 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
396.50
395.50
394.50
393.50
392.50
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)

9413282.0110

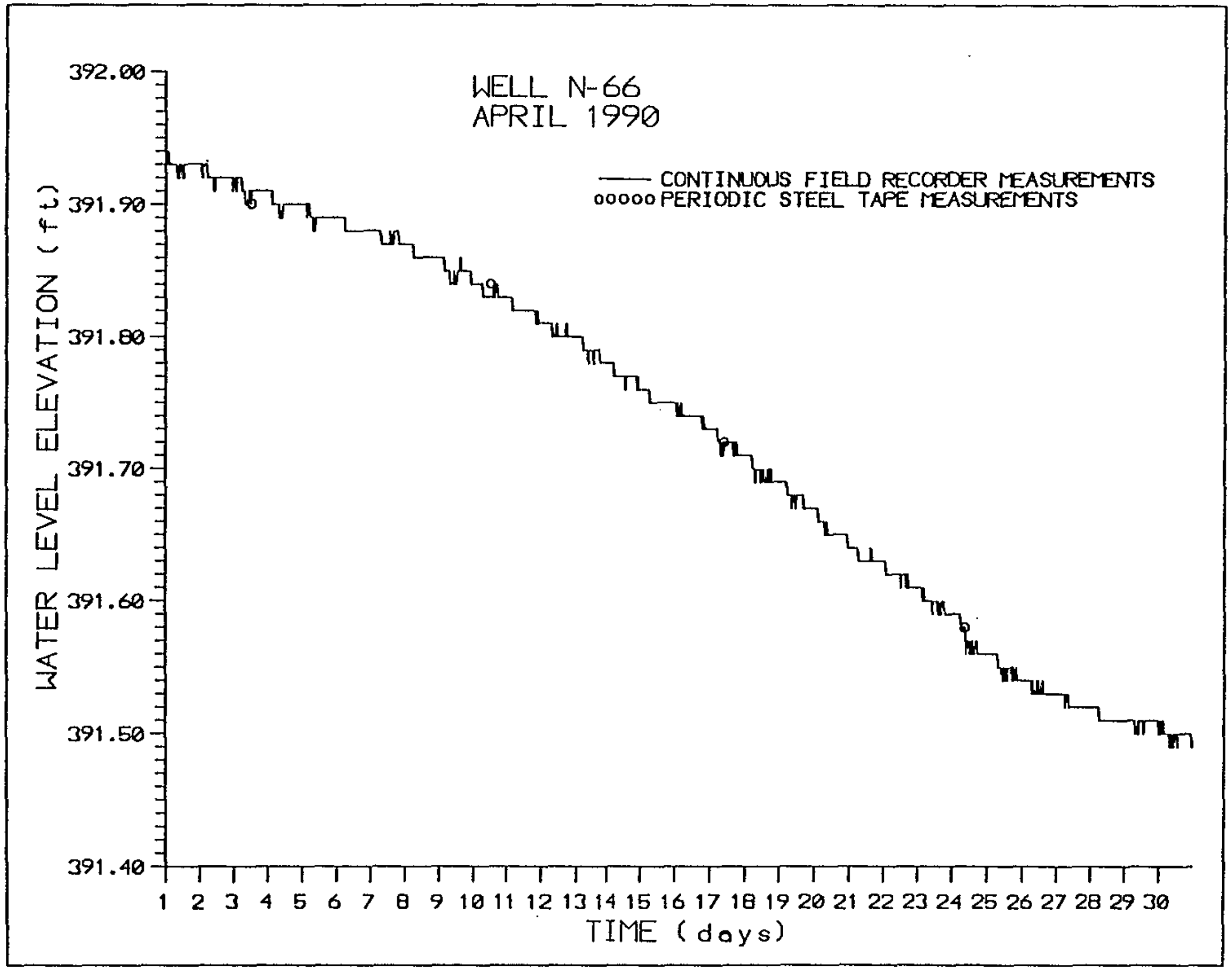


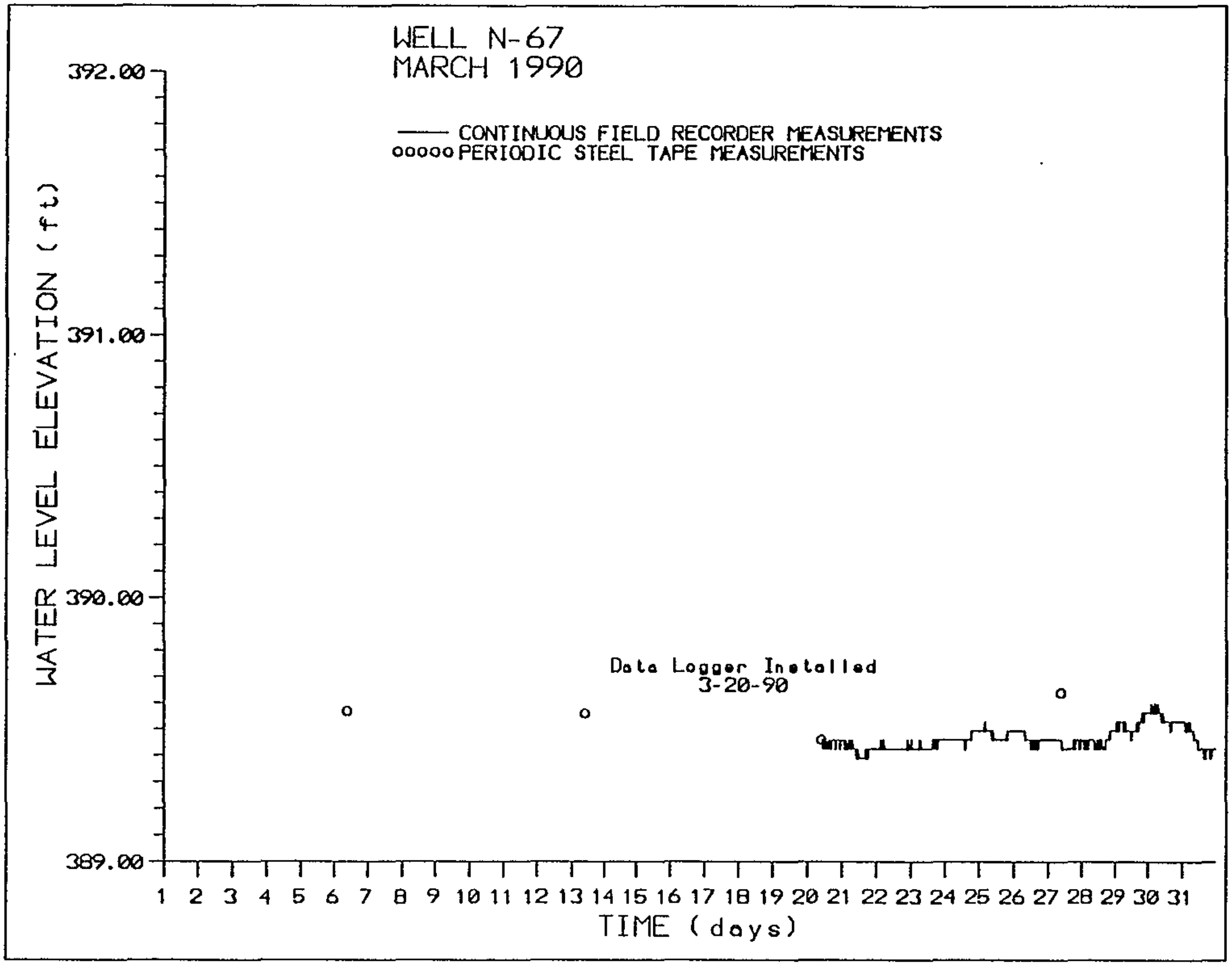

WELL N-58
JUNE 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
394.00
393.00
392.00
391.00
WATER LEVEL ELEVATION (ft)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)


WELL N-58
JULY 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
394.00
393.00
392.00
391.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)


WELL N-66
MARCH 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
394.00
393.00
392.00
391.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

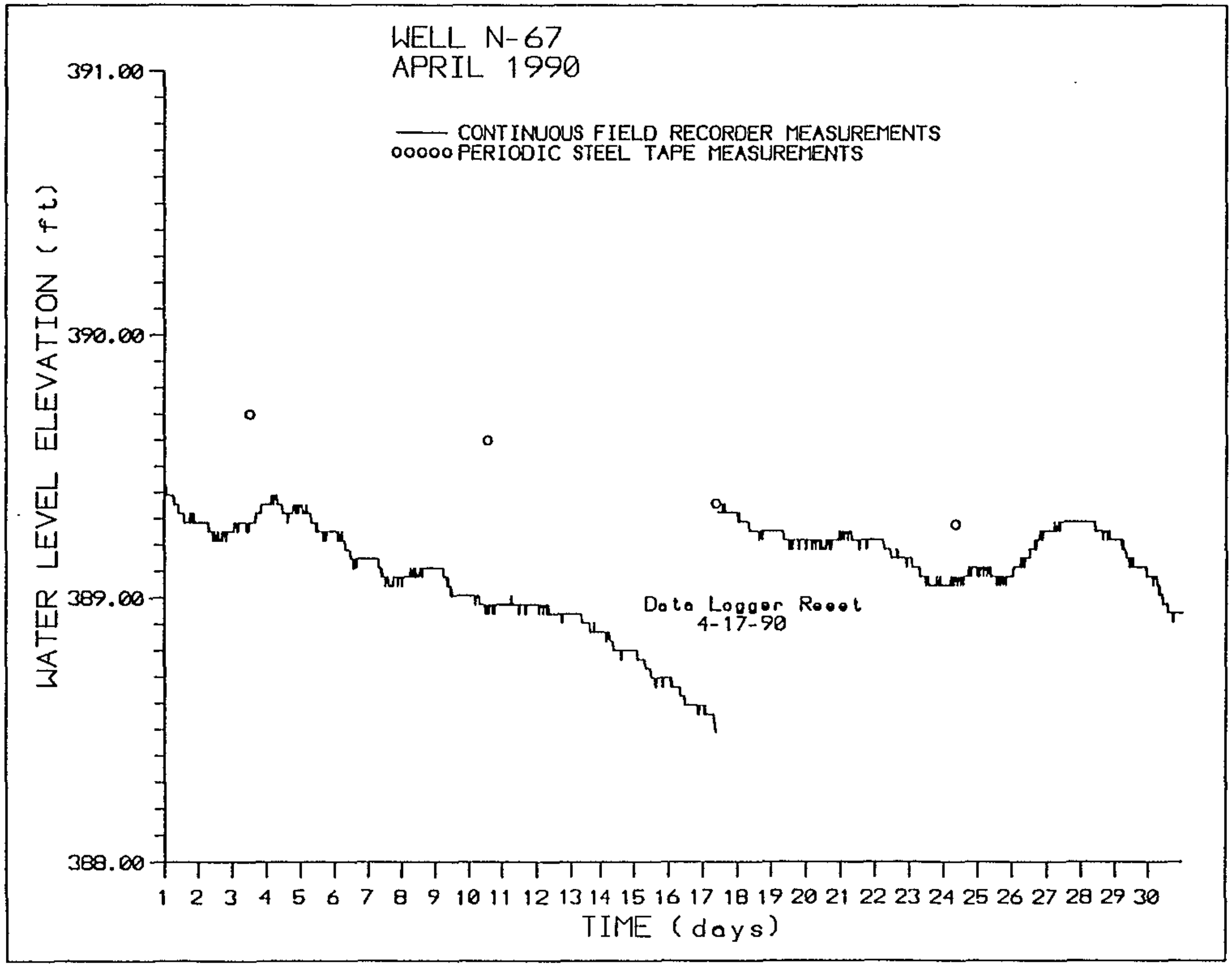
9413282.0114



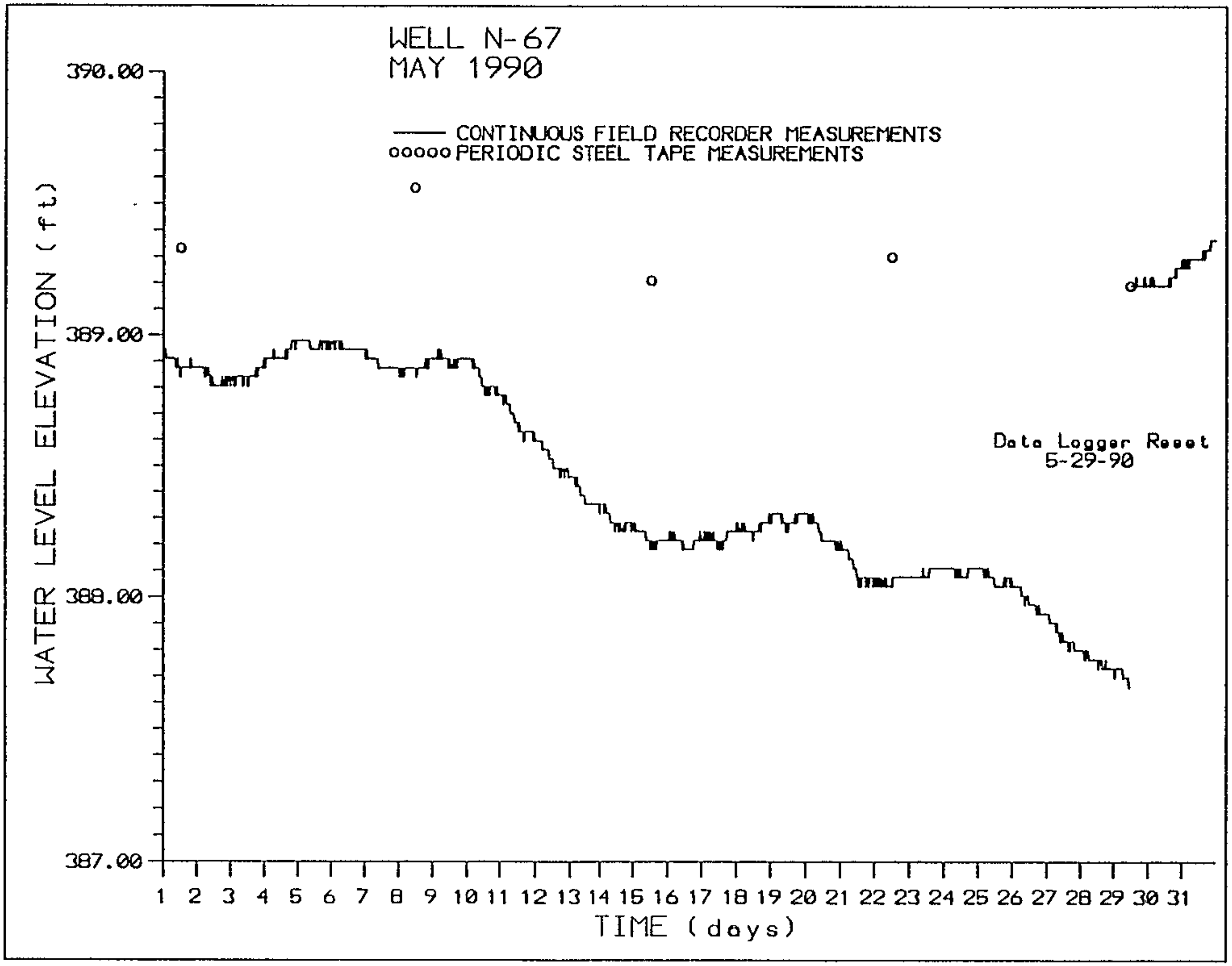


WELL N-67
MARCH 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
392.00
391.00
390.00
389.00
Data Logger Installed
3-20-90
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

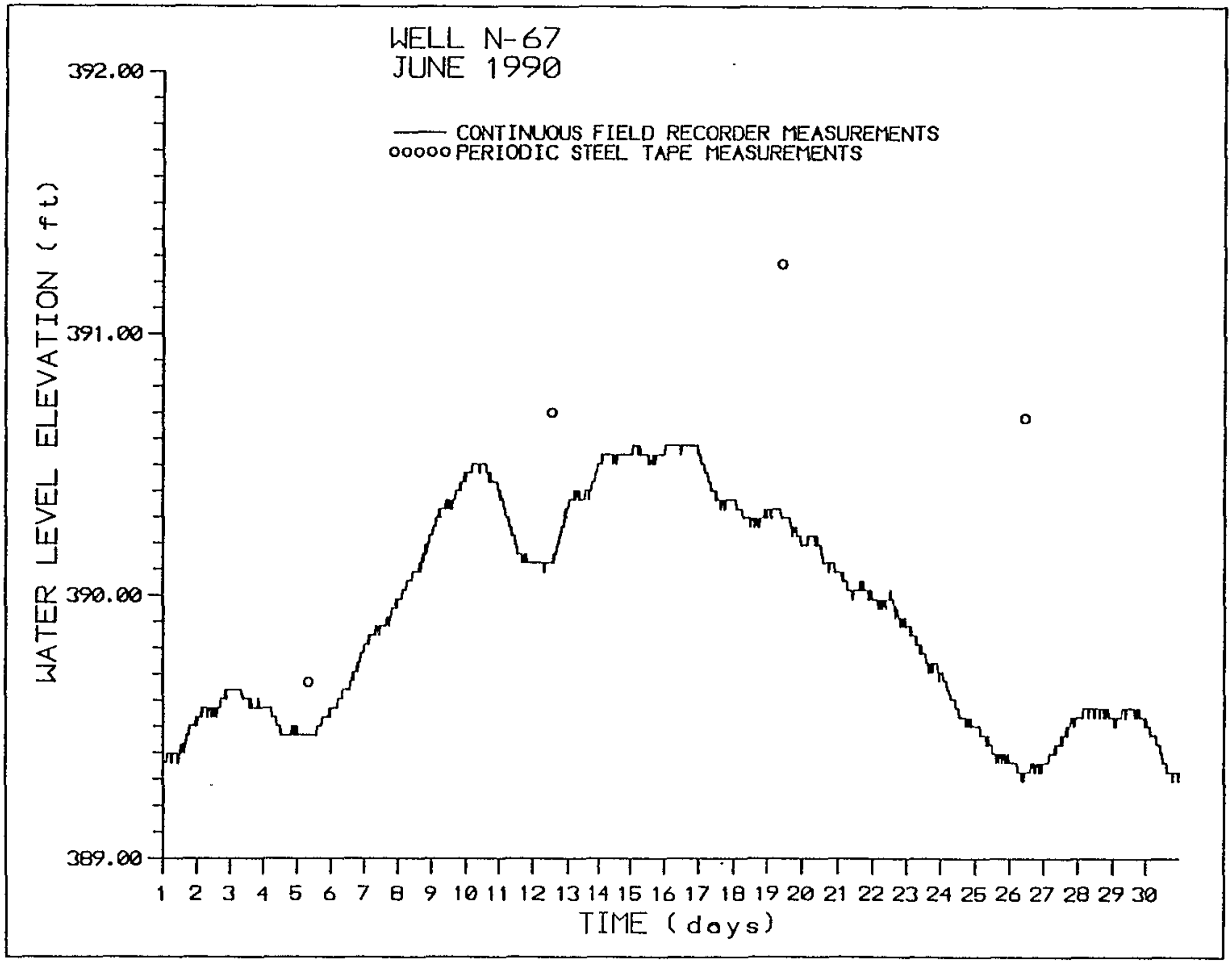
9413282.0116



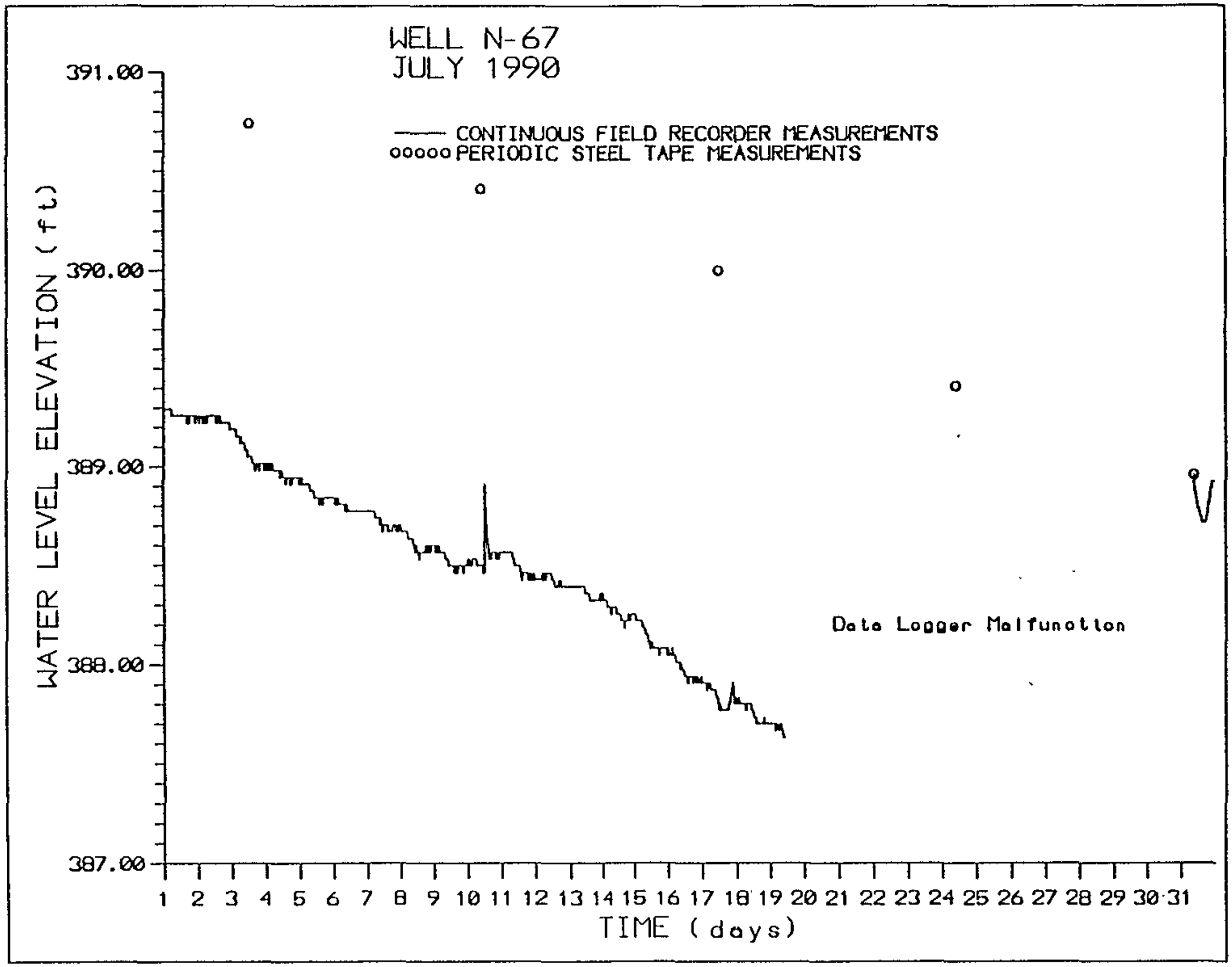
A.90


WELL N-67
MAY 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
Data Logger Reset
5-29-90
WATER LEVEL ELEVATION (ft)
390.00
389.00
388.00
387.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

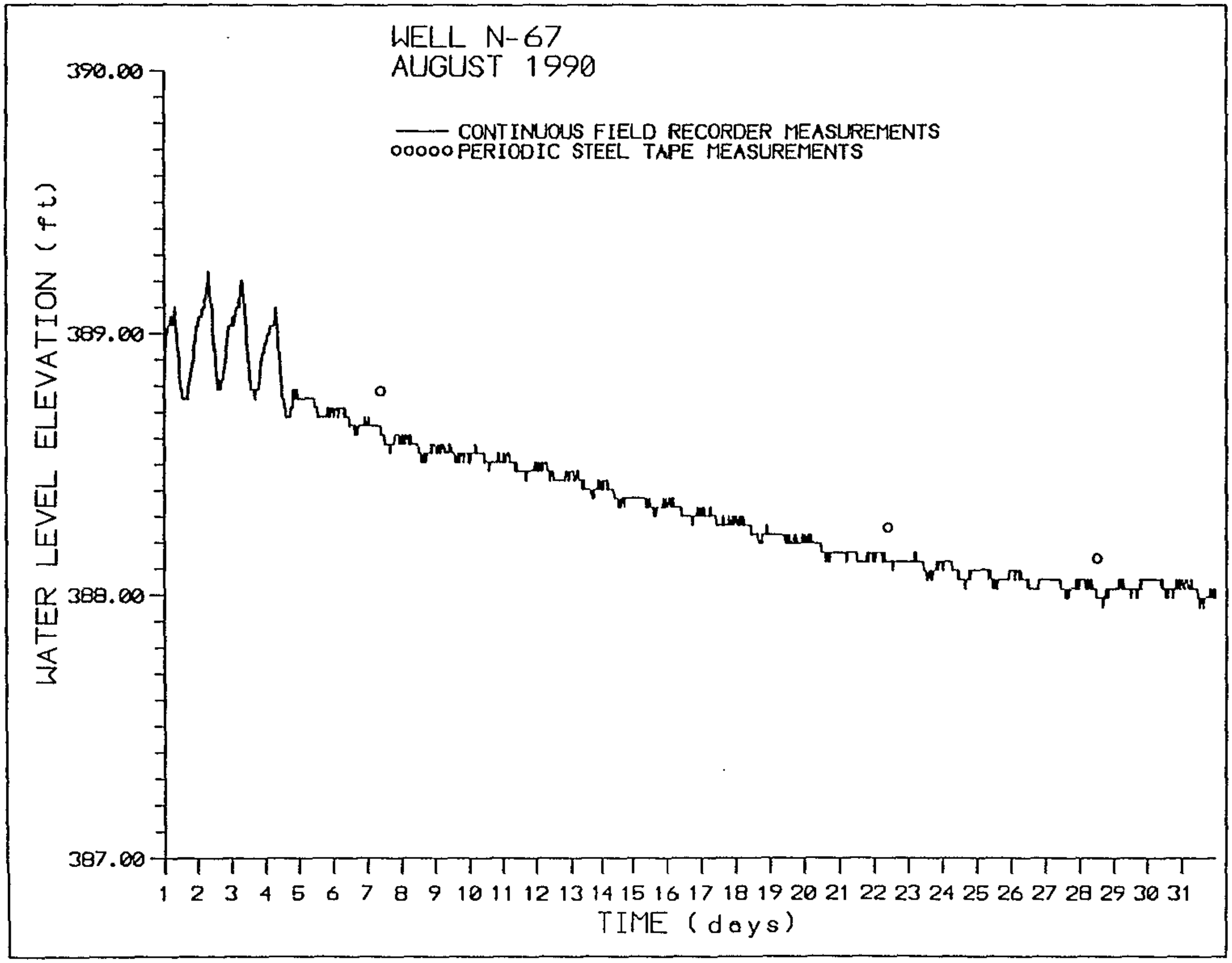
9413282.0118



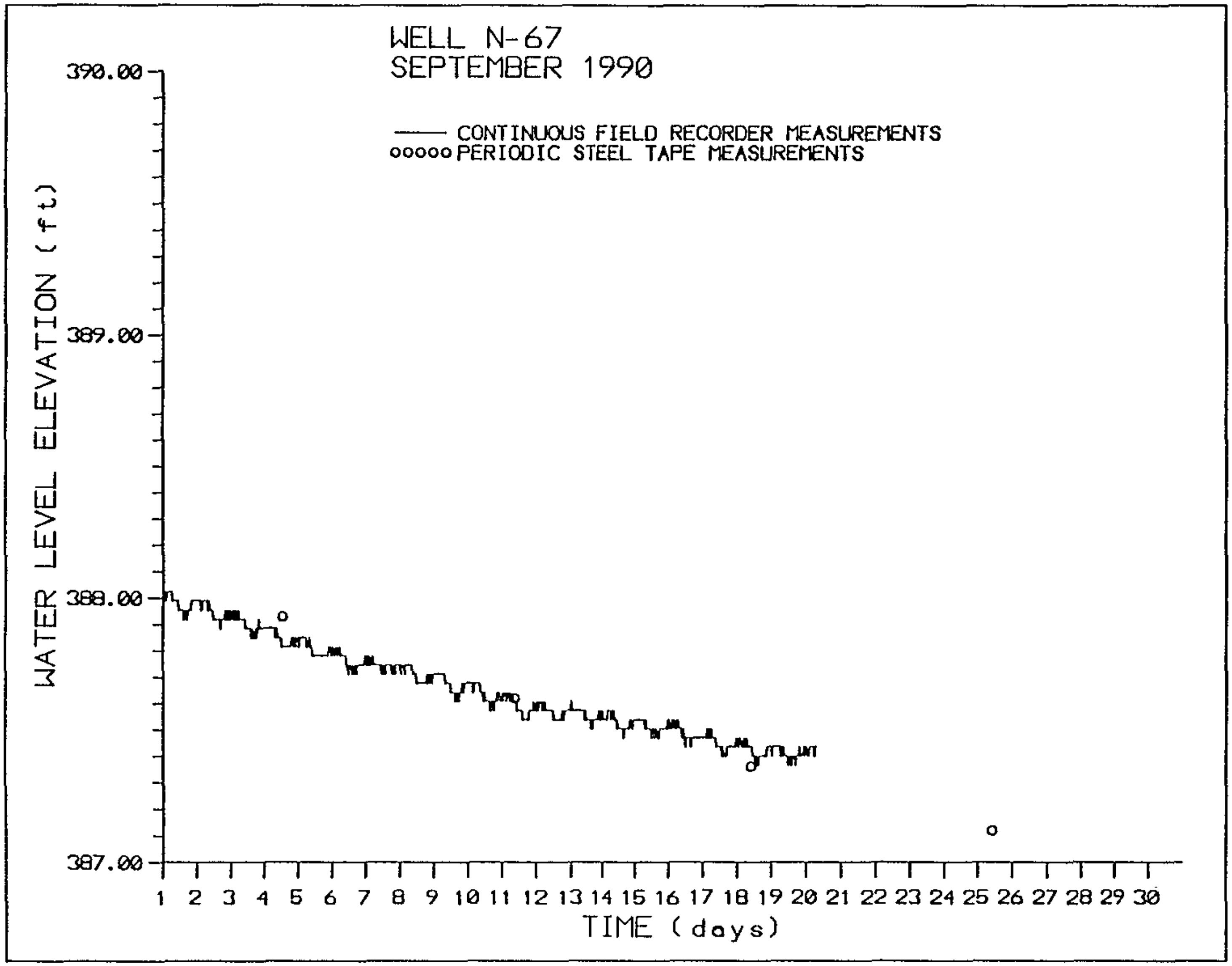
9413282.0119

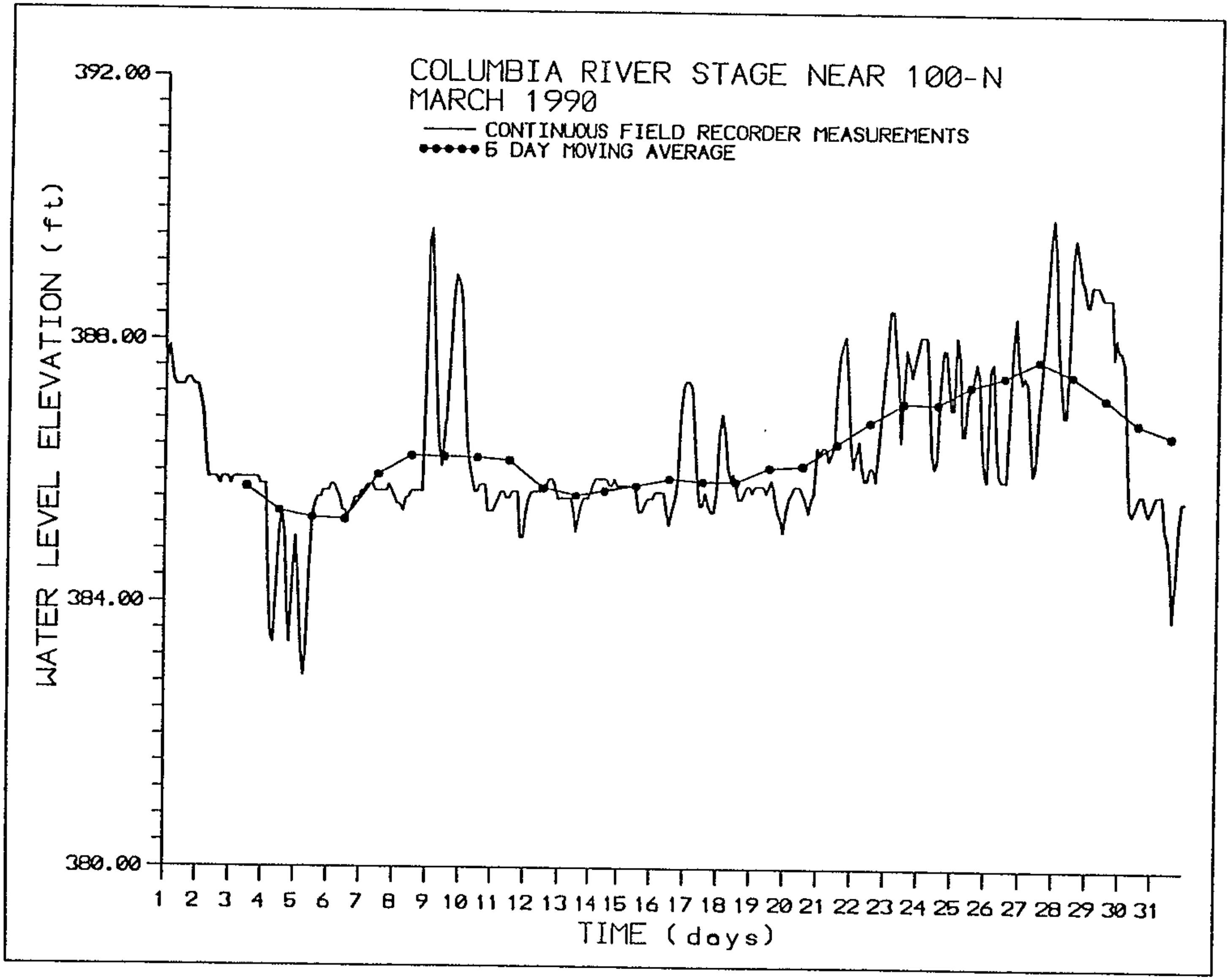


A.93

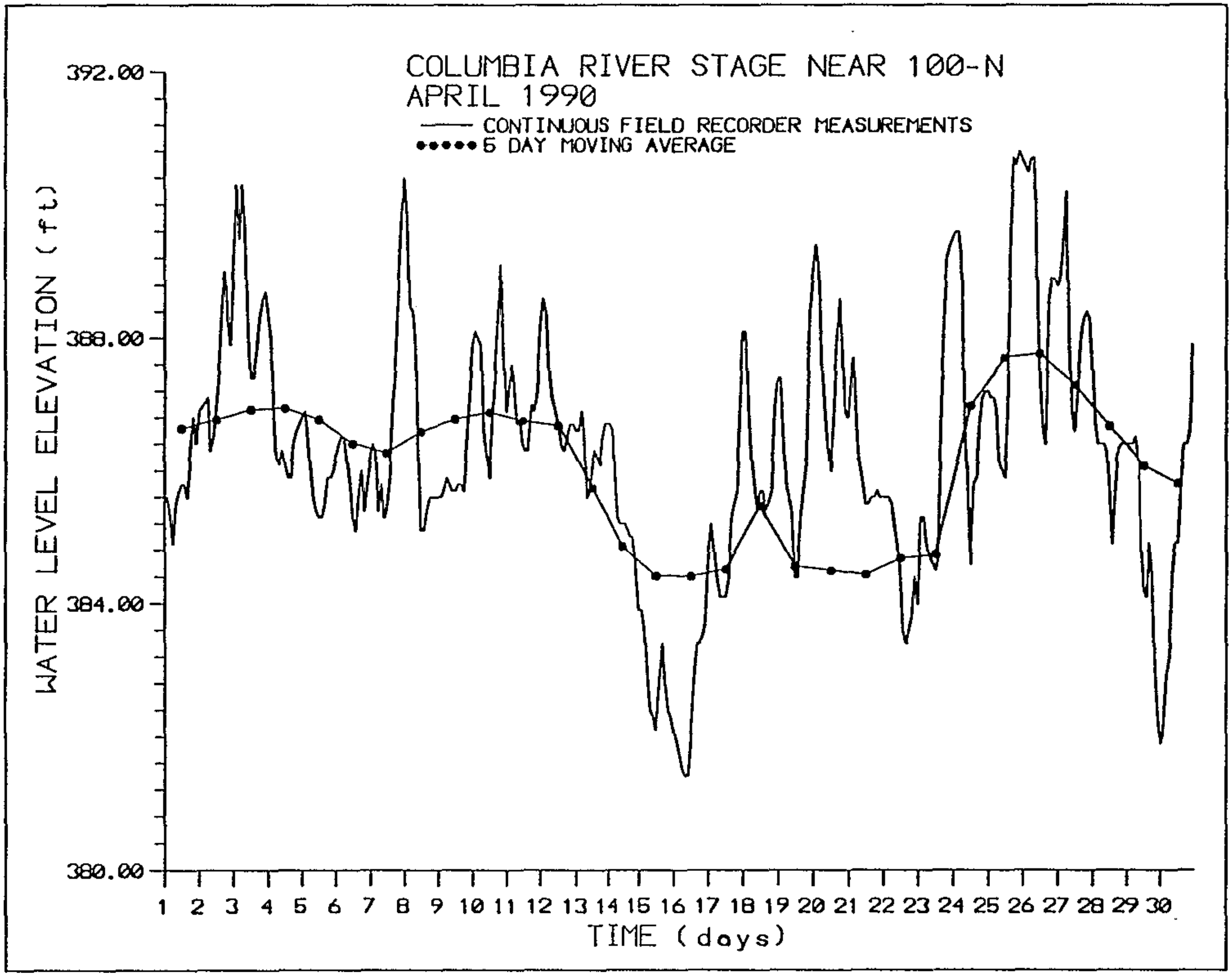

WELL N-67
AUGUST 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
ooooo PERIODIC STEEL TAPE MEASUREMENTS
WATER LEVEL ELEVATION (ft)
390.00
389.00
388.00
387.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

9413282.0121



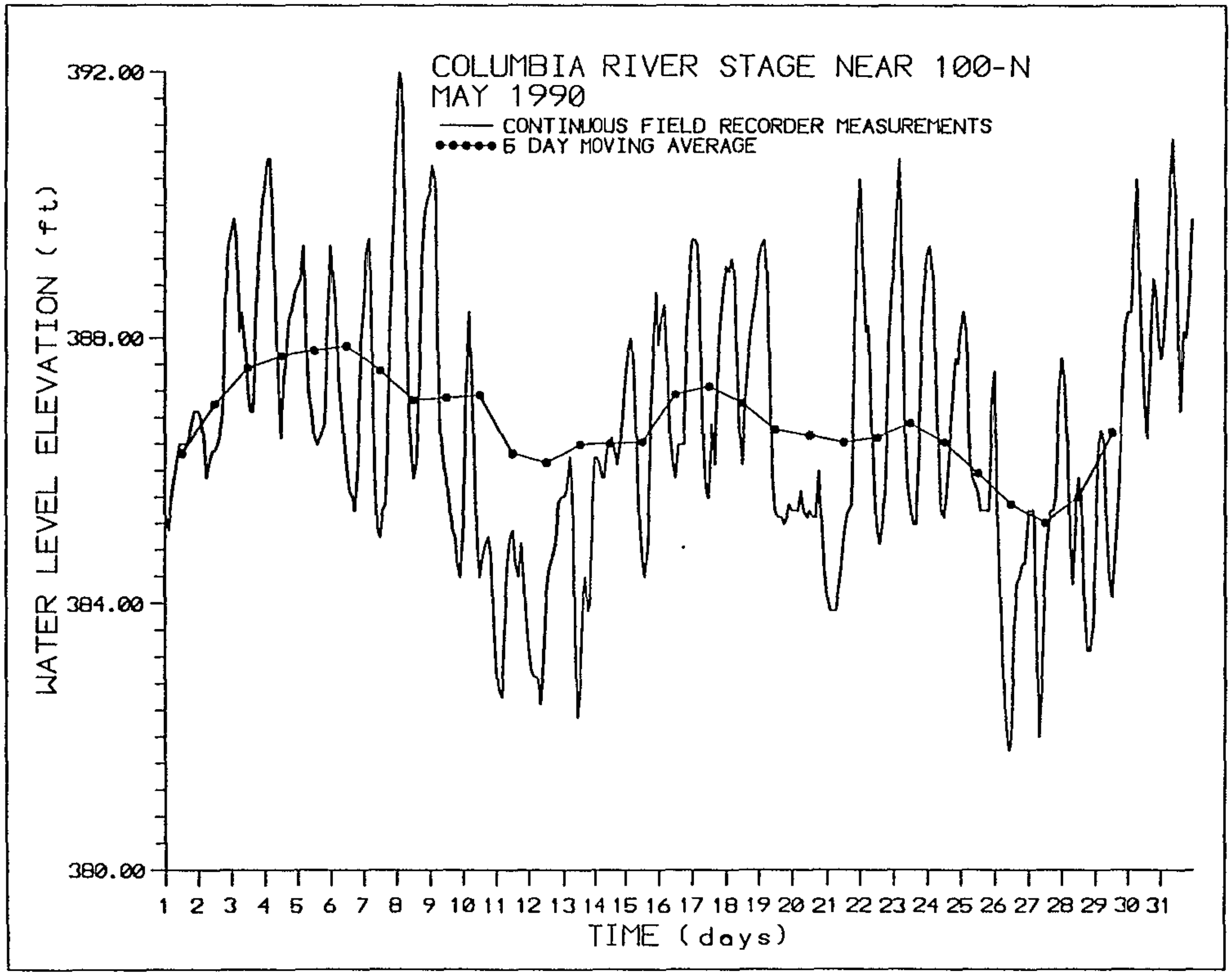

COLUMBIA RIVER STAGE NEAR 100-N
MARCH 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
5 DAY MOVING AVERAGE
WATER LEVEL ELEVATION (ft)
392.00
388.00
384.00
380.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

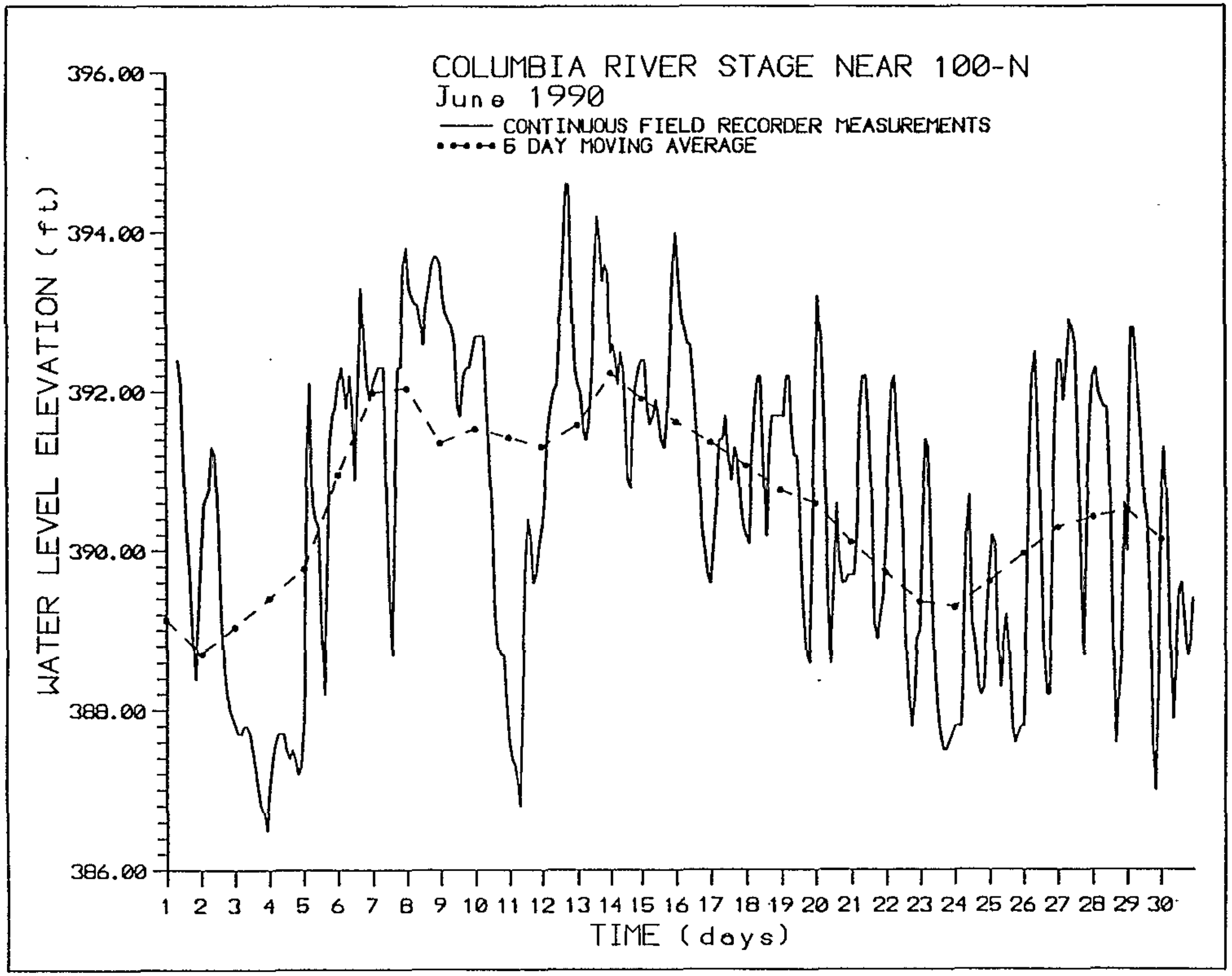
9413282.0123



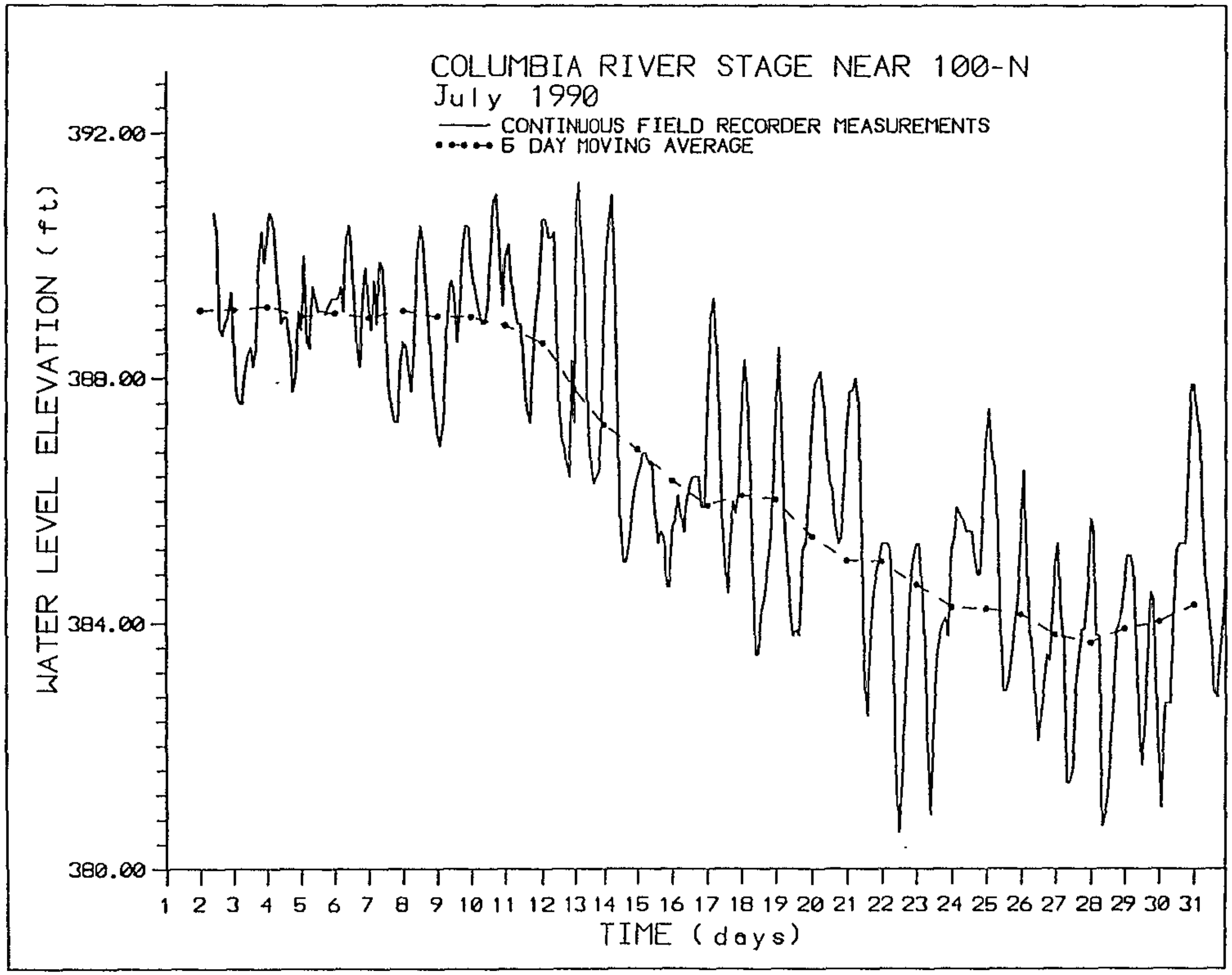
A.97

9413282.0124



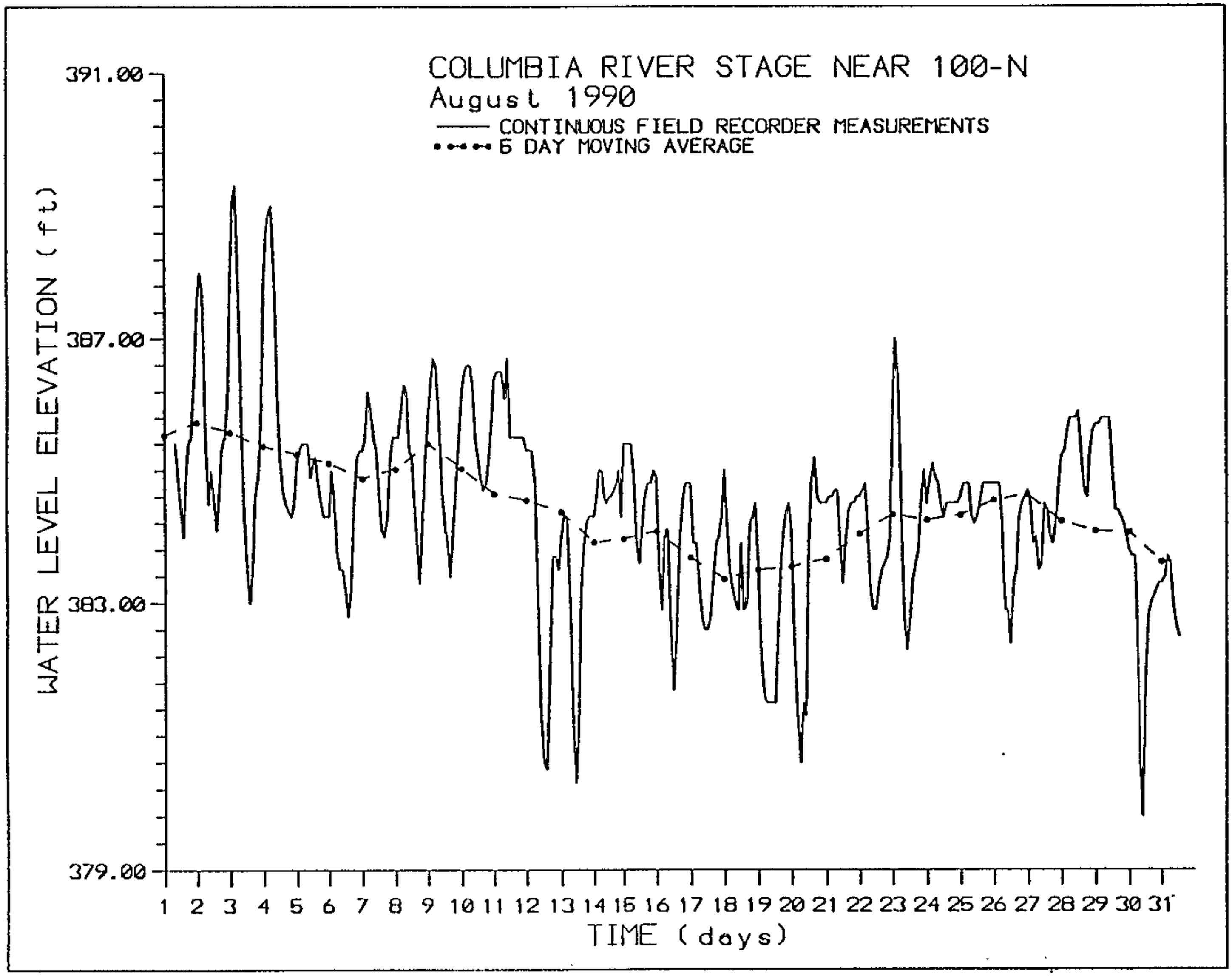

COLUMBIA RIVER STAGE NEAR 100-N
June 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
6 DAY MOVING AVERAGE
WATER LEVEL ELEVATION (ft)
396.00
394.00
392.00
390.00
388.00
386.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)

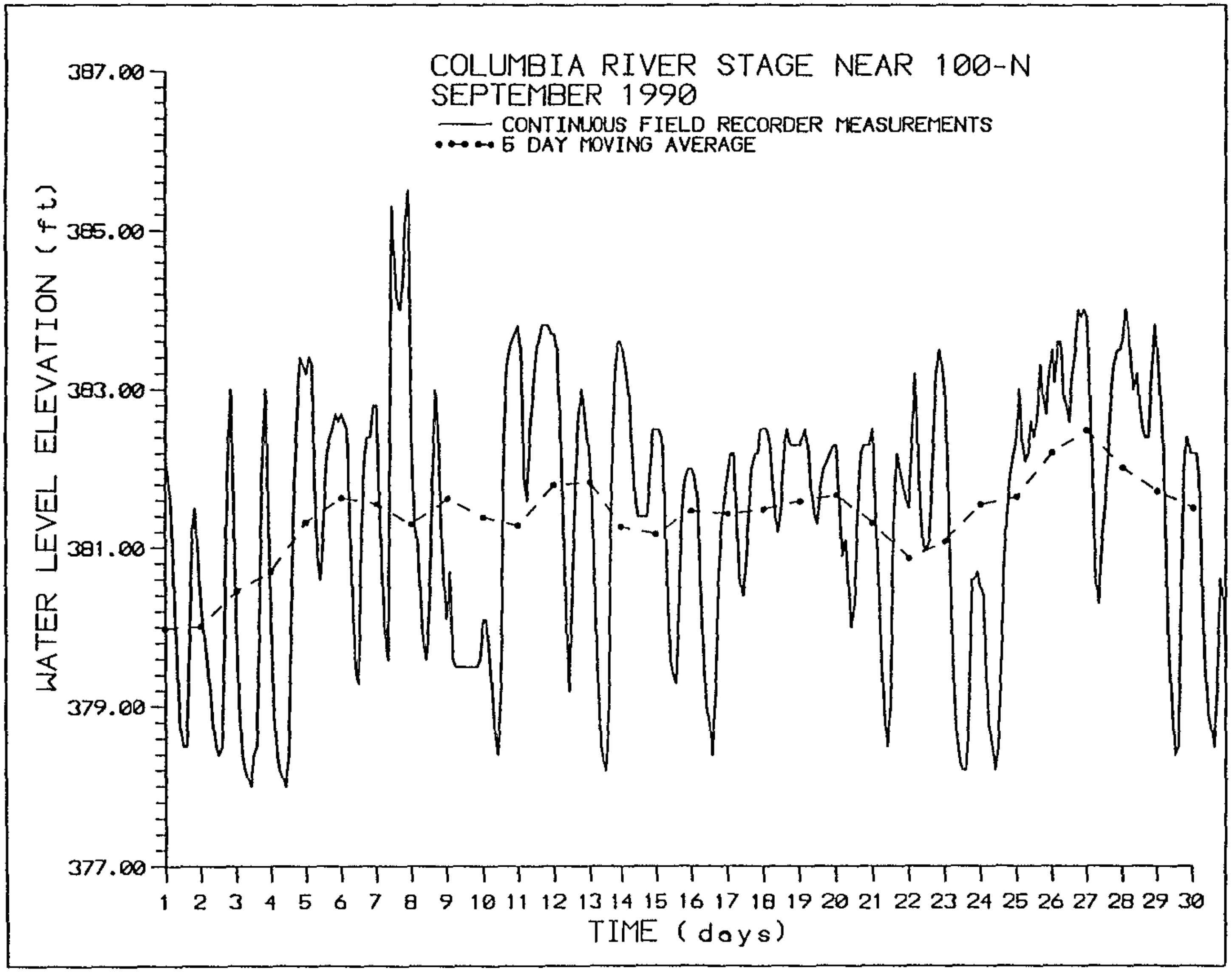
9413282.0126

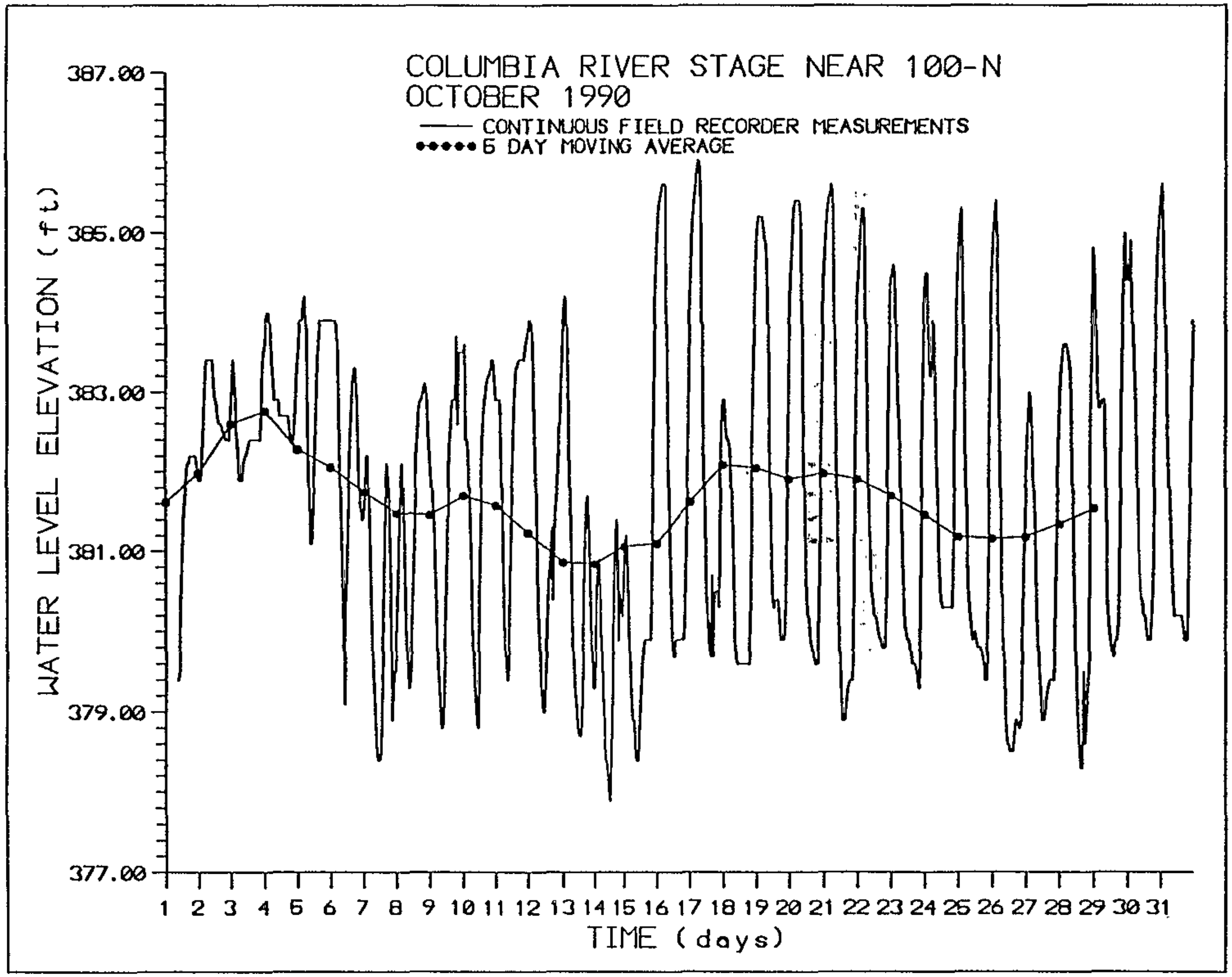


A.100

9413282.0127




COLUMBIA RIVER STAGE NEAR 100-N
SEPTEMBER 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
5 DAY MOVING AVERAGE
WATER LEVEL ELEVATION (ft)
387.00
385.00
383.00
381.00
379.00
377.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (days)


COLUMBIA RIVER STAGE NEAR 100-N
OCTOBER 1990
CONTINUOUS FIELD RECORDER MEASUREMENTS
6 DAY MOVING AVERAGE
WATER LEVEL ELEVATION (ft)
387.00
385.00
383.00
381.00
379.00
377.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
TIME (days)

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